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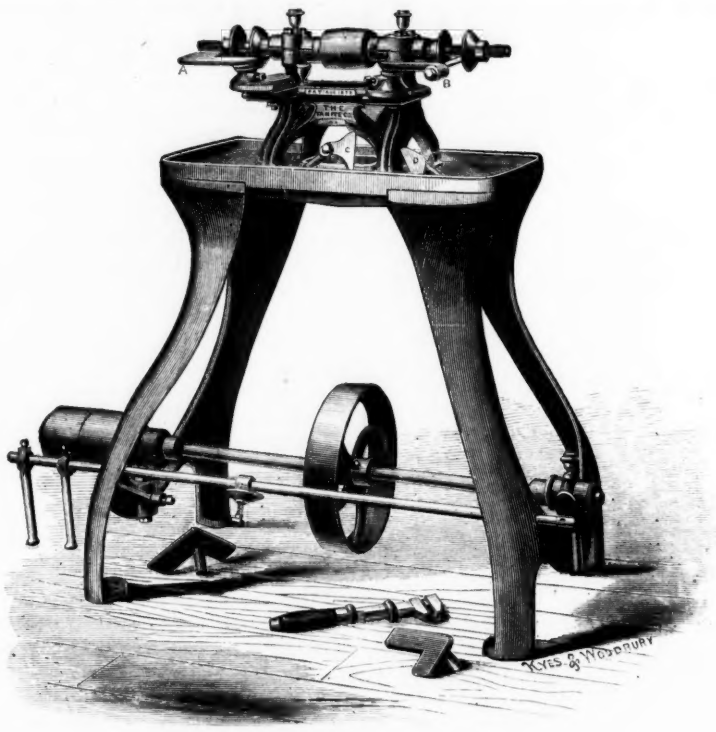
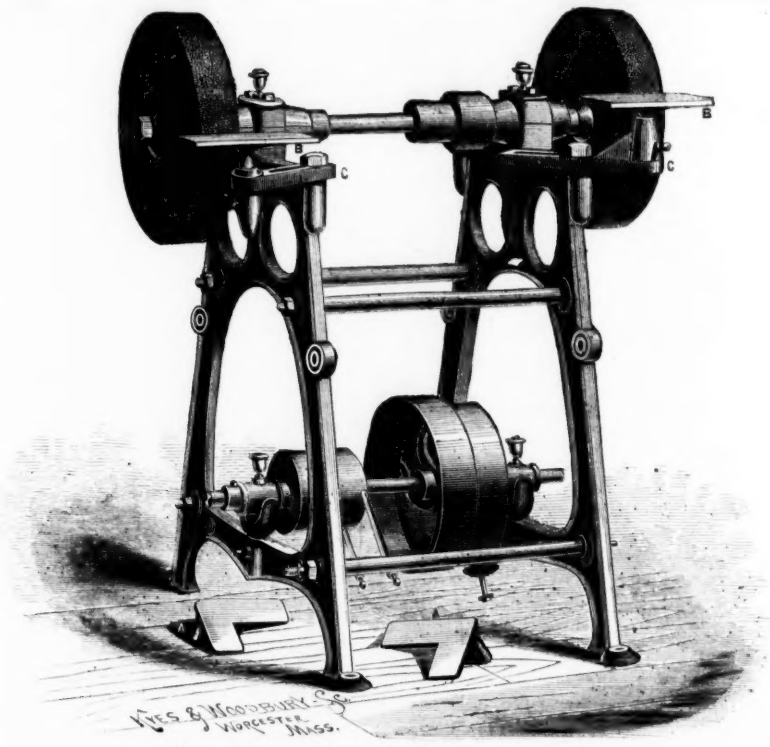
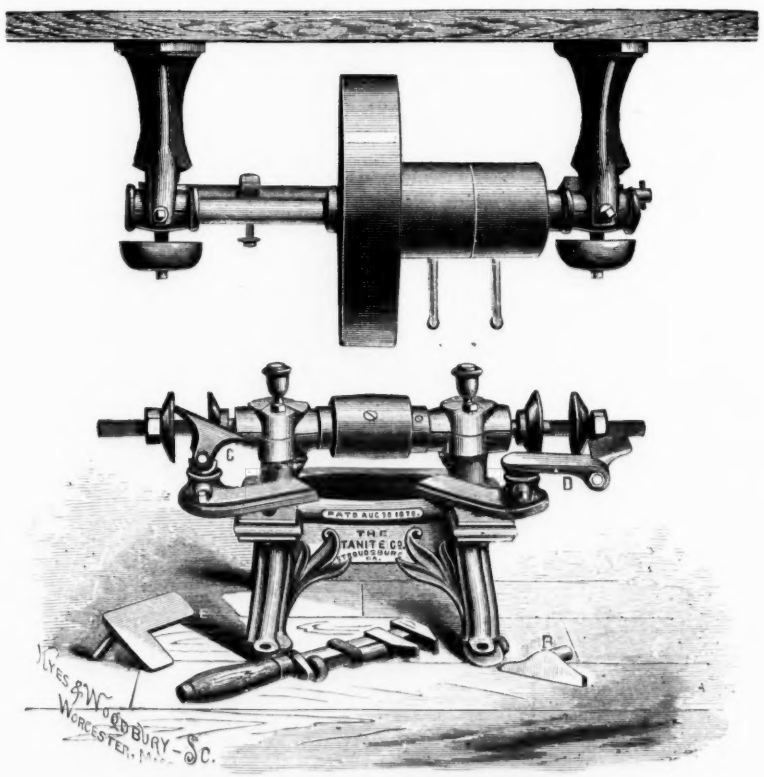


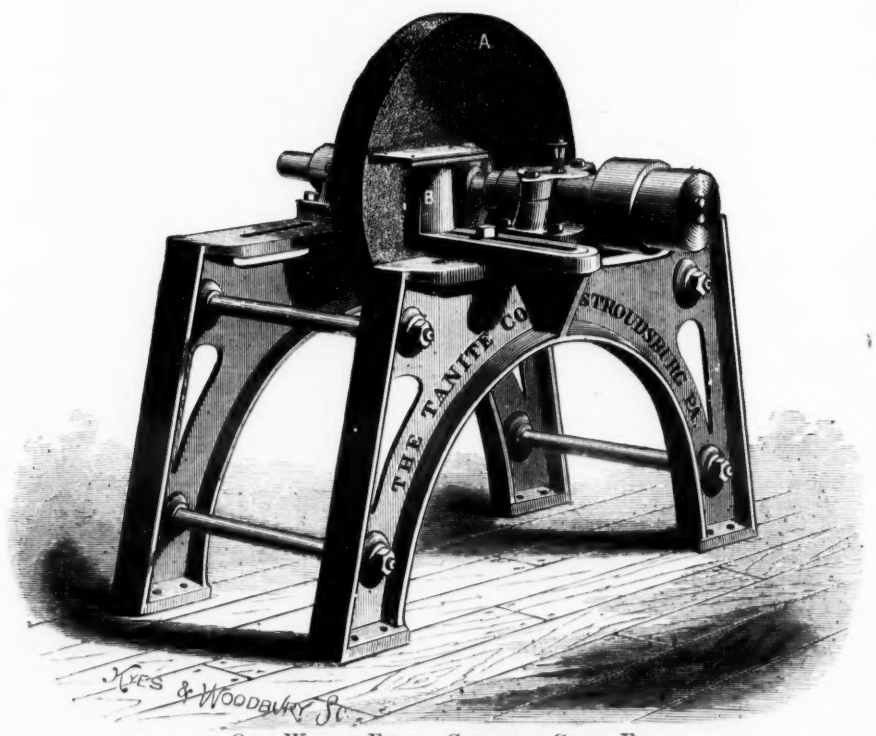
EMERY GRINDER NO. 1, ON TABLE.



TWO WHEEL EMERY GRINDER, CLASS F.



EMERY GRINDER NO. 1, WITH COUNTERSHAFT.



ONE WHEEL EMERY GRINDER, CLASS E.

New Emery-Grinding Machinery.

To use emery wheels safely and economically, it is absolutely necessary to have a first-class machine to carry them. In other words, a cheap machine, having a mandrel or spindle made of poor iron, and with untrue journals, will not carry an emery wheel without a great deal of noise, besides incurring a great danger of bursting the wheel, and either maiming or killing the operator outright. One of the most essential points in running emery wheels is to keep the wheel true, as little work can be done when the piece to be ground touches the wheel only upon one side. The Tanite Company, of Stroudsburg, Penn., have, through a long and constant study of the kind of machinery required to do general and special classes of work, succeeded in producing some very excellent machines, which we will describe by the aid of the new engravings on this page.

The emery grinder, No. 1, was designed for a general class of work, and is suited to the use of wood workers, or other mechanics, who desire to run small wheels for light work. It is intended to run wheels from 4″ to 8″ in diameter, and is to be set upon a wooden table or bench; in which case the table must be made in the very best manner, to avoid the least tendency to vibrate. The arbor is made of steel, and of ¾″ diameter. The flanges are 3″ in diameter. Each machine is provided with two face, and two side or surface rests. The face, and side or surface rests *B*, and *E*, are solid, and are used for plain, straight work; while for beveled work, the adjustable rests *C* and *D*, are used. These adjustments, together with the pivots *A*, admit of adjusting to suit any shape desired. The overhead work consists of a counter shaft, a pair of adjustable hangers, tight and loose pulleys of 4″ diameter, driving pulley of 12″ diameter, and belt shifter. It is preferable, when possible, to have an iron table to support emery grinders, as shown by the upper left hand engraving. This table is light, yet the metal is so distributed that it possesses great strength, and is not liable to vibrate. It will also be observed that the counter shaft is attached to the machine, so that the space over and about the machine is unobstructed by the usual belt.

The two wheel grinder, class *F*, is intended for wheels of either 14″ or 16″ diameter. This is the first machine offered by the Tanite Company for the size of wheels given, and is designed for general

machine shop work. It is strongly braced, having a counter shaft attached to the machine.

The arbor is of steel, of 1¼″ diameter, and is provided with cone pulleys, those upon the counter shaft being 12″ and 13″ in diameter. The tight and loose pulleys are 6″ in diameter. The counter shaft is generally attached to the machine, unless otherwise desired. The distance from floor to center of arbor is 37½″, and the size of base 20″x35″. The rests may be adjusted to any desired position.

The single wheel machine, class *E*, was designed for heavy work, and to carry a wheel of 24″ diameter, and 3″; in fact, wheels of any smaller diameter may be used upon this machine. It has a steel arbor of 2″ diameter, and is furnished with a cone pulley. The counter-shaft, which is placed over the machine, consists of the same number of pieces as that of No. 1, the tight and loose pulleys being 8″ in diameter. The steps of the cone are 13½″, 14½″ and 15½″ in diameter, respectively. This machine is furnished with reversible rest arms, which admit of unusual variation in height of rests. It is the most solid and substantial emery grinder yet made by the manufacturers, and should in all cases be used to wear wheels down from 24″ to 18″ in diameter, after which the wheels may be used upon smaller machines.

The Slide Valve.

GRAPHIC DELINEATIONS WITH DESCRIPTIONS OF ITS MOTIONS AND OPERATIONS.

By MELVILLE CLEMENS.

The slide valve is such a distinctive feature of steam engines, and of so important and common use, as to be an object of interesting and necessary study to engineers and mechanics.

It is a piece of mechanism which, with its appendages and co-operative connections, the valve gear, crank, and piston, presents a complex and attractive combination of mechanical movements. Its functions are, in fact, the dispensation of steam-engine work, controlling the admission, exhaustion, and release of the steam to and from the engine cylinders.

Any methods of graphic and descriptive representation of the motions and operations of this mechanism, which are new, or in better form for comprehension and practice, than those admirable methods in use, will be of interest and service to expert engineers and mechanics, and especially to mechanical students.

The writer, in making investigation of the friction of the slide valve, which involved the estimating of the resultant of steam pressures on the back and face of the valve, and, consequently the determining of the valve's positions over the steam ports at successive intervals of the piston's stroke, found room for simplification and addition to the methods in use for delineating the valve's motion and positions, relative to those of the crank and eccentric, which are illustrated in the diagrams and description here presented.

In all the diagrams, the dimensions of the slide valve taken for illustration are those required to give ⅞ inch lap, with 5 inches full-gear, throw of the eccentrics, 1¼ inches width of steam ports, 2½ inches, width of exhaust port, and 1 inch thickness of port bars—the valve being operated by the double eccentric, shifting-link and rocker arm, connecting the crank shaft to the connecting rod of the valve stem as commonly done in locomotive engines adapted for reversing the engine's motion, and for changing the cut-off.

Figures 1 and 2 relate to methods of determining by projection the relative positions of the crank and eccentric, in their respective circles of motion, at the crank's points of "dead centers," "steam admissions," "cut-off," "release," and "compression," due to different *lap* and *lead* of the same valve. A single eccentric is employed for illustration, as the valve's motion derived from the compound motion of two eccentrics, transmitted through a correct link gear, is essentially the same as the motion given to it by a single eccentric having the same lap, lead and travel.

In both figures the circle *B D C E*, is drawn to a given scale, so as to represent by scale the circle of motion of the center of the eccentric, and so that its diameter *B A C*, represents to scale its throw and the valve travel, and for convenience of illustration, the circle *B D C E*, also represents the circle of motion of the crank pin so that *A B* is the crank arm at the commencement of the stroke, and *A C* its position at the end of the stroke in direction of arrow *h*; *D A E*, at right angles to *B A C*, is taken for the line of middle position of stroke, both of the crank and eccentric.

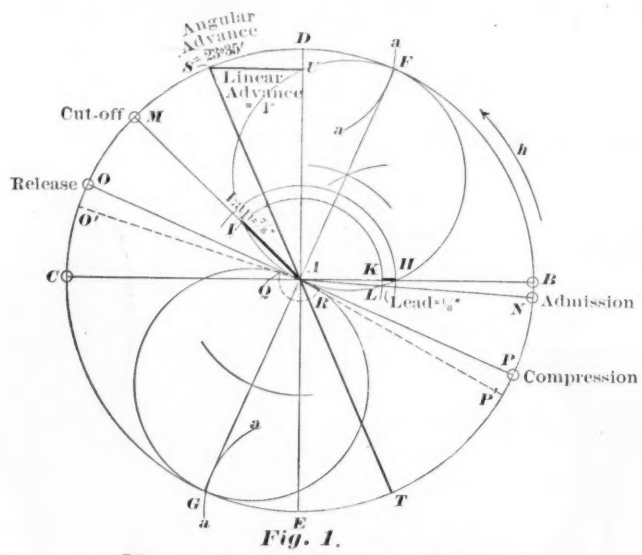


Fig. 1.

Diagram of Crank & Slide Valve Motions
Lap ⅞″; Lead ⅛″; Travel 5″; Cut-off ⅞th Stroke.
Scale=½

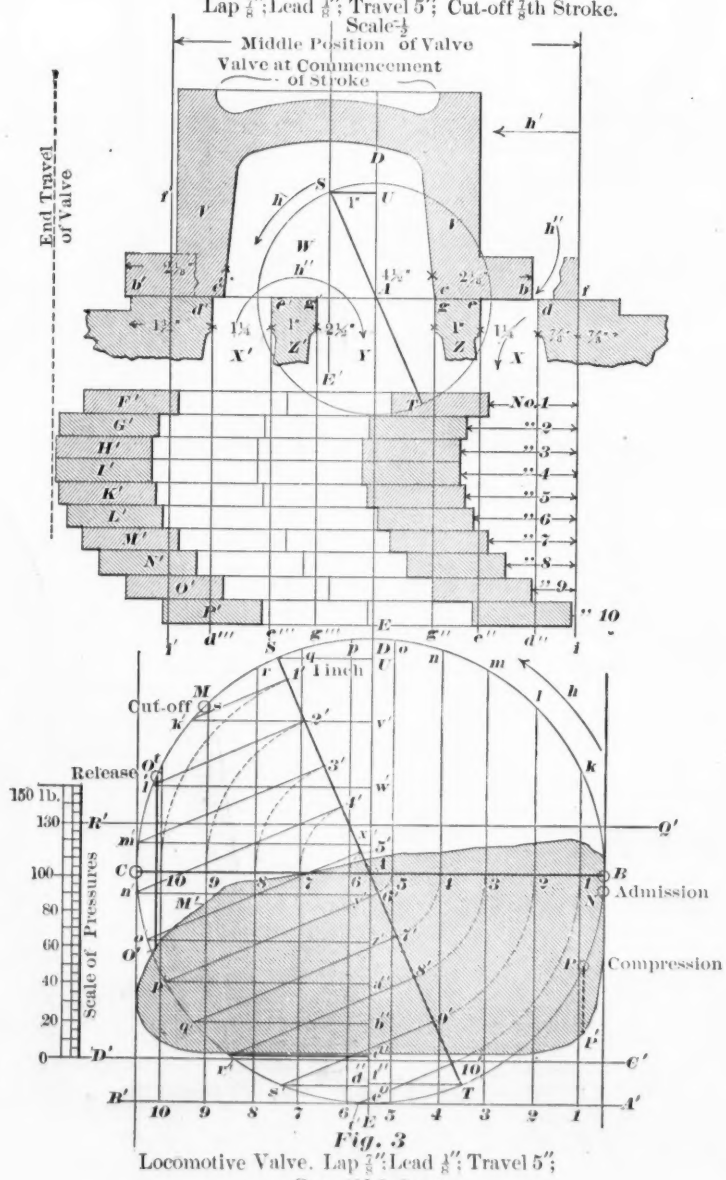


Fig. 3

Locomotive Valve. Lap ⅞″; Lead ⅛″; Travel 5″;
Cut-off ⅞th Stroke.
Scale for Valve=¼ Scale for Eccentric ½

TEN SUCCESSIVE POSITIONS OF CRANK AND VALVE.

It may be explained that the "angular advance" of the eccentric is its angle of advance from its middle position line *A D*, when the crank is at *B*, and, that its "linear advance" is its horizontal distance in advance of *A D*, when the crank is at *B*. The linear advance is always equal to the sum of the lap and the lead of the valve.

In Fig. 1, the lap ⅞ inch, the lead ⅛ inch, and the eccentric throw and valve travel of 5 inches being given, it is required to find, first, the angular advance of the eccentric, and, next, the positions of the crank in the circle *B D C E*, at the instants of the valve's cut-off, release, compression and admission of steam to the engine cylinder.

Take with the dividers, by the scale of the figure, the distance of the sum of the lap and lead (=linear advance)=⅞″+⅛″=1 inch, and from *D* and *E*, as centers draw arcs *aa*, *aa*; draw through *A*, a line touching the arcs *aa*, intersecting the circle at *F* and *G*. Then the angle *D A F*, will be equal to the "angular advance" of the eccentric, and the sine of the angle, *F U*=1 inch, will be equal to its "linear advance," and the angle will be 23°35′.

To represent the eccentric in its actual position of advance from *A D*, (its middle position) when the crank is at *B*, lay off *D A S*=*D A F*, for its angular advance, and draw *S U*=*F U*=1 inch, for its linear advance.

Next, to find the required crank positions, bisect the lines *A F* and *A G*, and draw on them as diameters two circles, each of half diameter of *B A C*. With a radius of the lap=⅞ inch, and from *A* as a center, draw an arc, cutting the upper circle at *I* and *L*. From *A*, draw lines through *I* and *L*, intersecting, respectively, the circle *B D C E*, at *M* and *N*. Then *M* will be the position of the crank at "cut-off," and *N* its position at "admission."

There being no "inside lap" of the valve (or projection over the port bars of its exhaust edges, when in its middle position) to find the points of "release" and "compression," draw a line through *A*, at right angles to *F A G*, instersecting the circle *B D C E* at *O* and *P*. Then *O* will be the position of the crank at "release," and *P* its position at "compression."

Had there been "inside lap" of the valves, the points would be found by drawing from *A* as a center, with a radius of the inside lap, an arc cutting the lower circle, as at *Q* and *R*, and by drawing lines from *A* through *Q* and *R*, intersecting the circle *B D C E* at *O'* and *P'*, which would be, respectively, the points of release and compression.

The line *A I* is equal to the *lap*, and *K H* to the *lead* of the valve.

In Fig. 2. is the same valve having the same lap, = ⅞ inch, but only 2½ inches travel and throw of the eccentric, and cutting off at ¼ instead of ⅞ the stroke, as before in Fig. 1.

It is required to find the lead, linear and angular advance, and points of admission, release and compression.

Take, to the scale of the diagram, the radius of the lap, = ⅞ inch, and from *A* as a center, draw an arc, cutting *A M* at *I*, and *A B* at *K*. From *A* and *I* as centers, with a radius of ½ *A B*, = ⅜ inch, draw intersecting arcs from their points of intersection, with the same radius, drawa circle through *A* and *I*, touching *B D C E* at *F*, cutting *A B* at *H*, and the arc *I K* at *L*. Then, *A I* is the lap, and *K H* the lead of the valve.

Draw a line from *A* through *L*, intersecting *B D C E* at *N*, which is the point of admission.

Draw a line through *A* and the center of the circle *A I F H L*, intersecting *B D C E* at *F* and *G*; and draw a line through *A*, at right angle to *F A G*, intersecting *B D C E* at *O* and *P*:—then *O* will be the point of release, and *P* the point of compression.

D A F, and its equal angle *D A S*, will be the angular advance (=73° 45′) of the eccentric, and *S U*=sine 73° 45′=1.20 inches which will be the linear advance.

Figs. 3 and 4, correspond, respectively, to Figs. 1 and 2, in relation to the valve's lap, lead and travel, and the points of admission, cut-off, release and compression of the steam. And they show further the relative positions of the crank, valve and eccentric, at ten additional, successive points of the forward stroke, corresponding to the ten points of the piston at which steam-indicator cards are ordinarily measured.

The valve is shown separately, by a new method of projection, in the ten positions; and the portion of the diagram figures, showing the coincidental positions of the crank and eccentric, have drawn upon them indicator cards (copied from practice), with their ordinates of pressure—measurements on the same lines as the crank ordinates of its circular motion.

As the letters and figures of reference are alike for both Figs. 3 and 4, the description of one applies as well to the other.

The line *B A C*, indicates the piston's forward stroke; the half circle *B D C*, the crank pin's movement; *D A E*, the middle position of the piston or crank, and also of the eccentric; *S A T*, the radius line, denoting the position of the eccentric at the commencement of the stroke, and *S U*, its linear advance.

Divide *B A C*, into ten equi-distant points (as ordinates are spaced on indicator cards) marking them, progressively, 1, 2, etc., up

to 10. Draw, at right angles, to *B A C*, through the ten points, parallel lines intersecting, respectively, the half circle *B D C*, at *k*, *l*, *m*, *n*, *o*, *p*, *q*, *r*, *s* and *t*, and produce them below to meet a line *A' B'*, parallel to and below *B A C*, marking their points of intersection the same as on *B A C*. From *A*, as a center, draw arcs from the five points in *A B*, to line *A T*, and also from the five points in *A C*, to line *A S*, which spaces the line *S A T*, the same as line *B A C*. Draw lines from these ten points in *S A T*, at right angles to it, intersecting the half circle *S C T*, at *k'*, *l'*, *m'*, etc., to *i'*. These points mark the ten successive positions of the eccentric, which are coincident with the ten crank positions, *k*, *l*, *m*, etc. Draw from the ten points *k'*, *l'*, etc., to the line *D A E*, the ten horizontal lines *k' v'*, *l'*, *w'*, etc., which will be the ten successive distances the valve has been moved from its middle position, coincident with the ten piston positions, 1, 2, 3, etc.

The valve *V*, is shown in full view, in its position at the commencement of the stroke, lying over the steam ports *X*, *X'*, and exhaust port *Y*. The admission edges (valve ends) are *b*, *b'*; its exhaust edges are *c*, *c'*, and W, its exhaust cavity. The admission edges of the steam ports are *d*, and *d'*, and its exhaust edges are *e*, and *e'*. The edges of the exhaust port are *g*, and *g'*.

Vertical lines, *f i*, and *f' i'*, are drawn across the valve ends when at its middle position. Vertical lines, *d d''*, and *e e''*, and *d' d'''*, *e' e'''*, are in continuation of the steam ports, while *g g''*, and *g' g'''*, are exhaust-port lines.

Crossing these lines at right angles, are shown ten overlapping plates, *F'*, *G'*, etc., representing the valve in the ten positions it has, respectively coincident with the ten described positions of the piston and eccentric. These positions are given by setting off from lines *f i'*, and *f' i''*, successively, the distances marked Nos. 1, 2, etc., for the end positions of the valve; the distances being, respectively, the same as the eccentric-travel distances, *k' v'*, *l' w'*, etc.

Taking *A' B'*, for vacuum line, *C' D'*, atmospheric line, and lines 1, 1, 2, 2, etc., for ordinate lines, indicator cards taken from the engine, may be plotted on the diagrams, as shown by the shaded portions; when the diagrams will show concisely and graphically the relative positions and operations of the valve and piston and the steam distribution.

To estimate by such diagrams the work of frictional resistance of an engine, due to the valve and eccentric friction, take the valve friction as follows, viz., for each of the ten valve positions find the area in square inches of the valve face exposed over the steam ports, for the two admission and two exhaust edges separately, by measurements from the diagram of the valve positions, and the known length of the steam ports. For each area exposure thus found, find from the indicator card the steam pressure acting thereon, and take their products, adding together all the products, and dividing the sum by ten, will give the mean pressure in pounds on the underside of the valve during the stroke. Taking this total pressure from the total pressure on the back of the valve (area by boiler pressure) gives the resultant mean pressure on the valve during the stroke.

If, now, the coefficient of the valve friction be taken as 35 per cent. of the pressure on it (agreeing with actual tests with steam at 100 to 130 lbs.), the resisting force on the valve stem is readily estimated.

This force transmitted to the eccentric, produces greater frictional resistance of the eccentric than the valve. Taking for the coefficient of friction of the eccentric, say, 15 per cent. of the force of the valve resistance, and adding it to the force of valve resistance, gives the total mean resisting force on the eccentric, which, multiplied by the half-circumference of the eccentric in feet, gives in foot pounds the work the eccentric does in each stroke.

Its ratio to the indicated foot pounds of the piston's power in the same stroke, is the ratio of valve and eccentric resistance to the indicated power of the engine.

By estimates, made in this way, the friction of valves and eccentrics in first-class locomotives range from 15 to 30 per cent. of their indicated horse power, varying according to longer or shorter cut-off, speed, the dimensions of eccentrics and valve gear, and the methods of oiling and protecting the frictional surfaces.

Fig. 5 is a method of showing the valve motion and steam distribution by "motion curves." The valve has the same lap, lead and travel as in Figs. 1 and 3. The vertical line *A C B* is the piston's stroke, and the circle *A E B D*, the crank's circle of motion in direction of arrow *a*, the points of cut-off, release, compression and admission, being, respectively, *Q' R' S'* and *T'*. The smaller inner circle is the circle of motion of the eccentric, whose linear advance is *S U* = 1 inch, as before. A square, *F G H I*, is drawn on the large circle, and the sides, *F H*, *G I*, divided into six equal parts by lines *K L*, *M N*, etc., forming ordinate lines of the crank's motion, as it takes the positions marked 1, 2, etc., up to 12, in one revolution. The eccentric circle is similarly divided and its coincident positions marked 1', 2', etc., to 12'.

The valve *F'* is supposed to move at right angles to the piston, on line *G F*, in direction of arrow *m*. Its admission edges are *b*, and *b'*, and its exhaust edges are *c* and *c'*. The admission edges of the steam ports are *d* and *d'*, and their exhaust edges are *e* and *e'*. The exhaust-port edges are *g* and *g'*. The port lines are drawn full across the diagram, and parallel to them are drawn the middle-position lines *f i* and *f' i'* of the valve ends. The valve is shown in full, in its position at the beginning and end of one revolution, and its successive positions are projected on the ordinate lines *K L*, *M N*, etc., by full-shaded portions in the forward stroke, and dotted portions in the back stroke. The valve positions are found and laid down from the eccentric motions, as described of Figs. 3 and 4.

Four curves, representing respectively, the motion of the admission edges *b* and *b'*, and exhaust edges *c* and *c'*, are formed by connecting those points by lines drawn through them as they take, in succession, the different positions of the valve shown. The numbers 2", 3", etc., on the curves denote the successive position of the valve.

This method of projection, exhibits most graphically the steam distribution, the shaded portion *L'* representing the period of the steam admission, the shaded portion *N'*, the period of its expansion, the shaded portion *R'* the period of release, on the driving side of the piston in the forward stroke; while the shaded portion *M'* shows the period of exhaust opening, and the shaded portion *O'*, shows the period of compression in front of the piston in the same stroke.

In the foregoing descriptions, the piston and crank's relative motions, as affected by the connecting rod, have not been taken into consideration.

The diagrams are correct in their representations of the motion of the valve relative to that of the crank; but they are not strictly accurate in relation to the piston's motion, because the varying angular positions of the connecting rod affects the motion of the piston, so that it is behind the crank during the front stroke, and in advance of the crank throughout the back stroke.

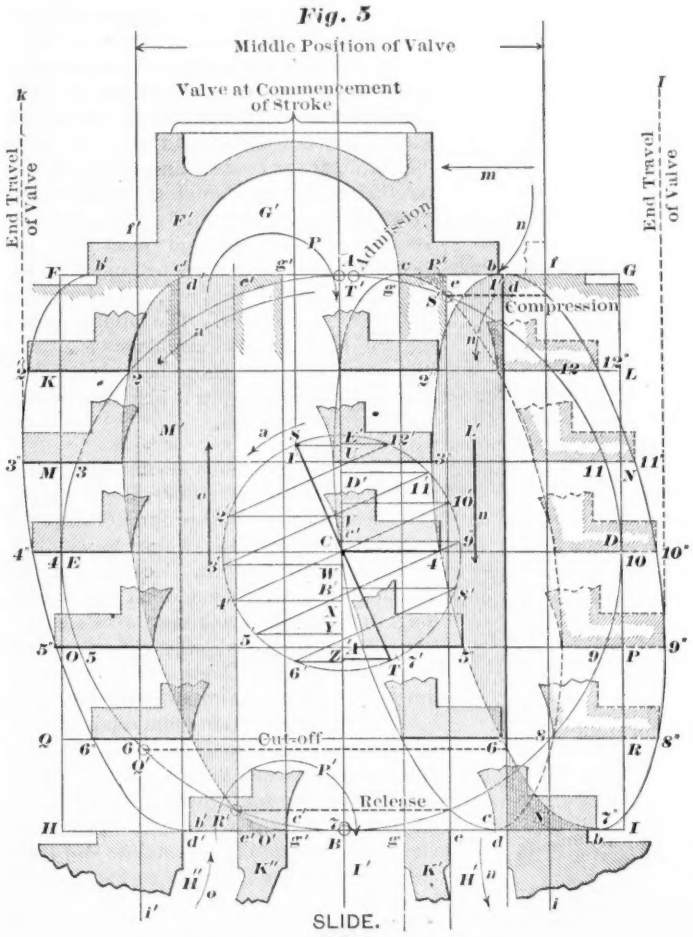
The period of steam admission is, therefore, greater for the front stroke, and less for the back stroke, than indicated in the diagrams. The points of release and compression are so near the end of the stroke, where the angularity of the connecting rod vanishes, and the horizontal motions of the crank and piston are nearly alike, that the variation there is unimportant.

The diagrams give, however, correct mean positions for all the points of steam distribution; for, what is exceeded in one stroke is receded in the other. Indeed, they give a better measure of the quality of the exhaust, as to time, in being correct for the crank's motions, than were they exact measure of the piston's motion.

Underground cables for telegraphic purposes are being laid in France from Nancy to Paris. A line of twelve insulated wires is placed in a large tube of cast iron. At suitable distances doors are constructed so that a section can be removed and replaced without having to open the ground, as in Germany, where the cables are imbedded in asphalt.

The Delaware & Hudson Canal Company, says the *National Car Builder*, are putting in the inside fire box sheets of locomotives in two pieces, the upper one smooth, and the lower one corrugated.

Fig. 5



Valve, Lap $\frac{7}{8}$"; Lead $\frac{1}{8}$"; Travel 5"
Cut-off $\frac{7}{8}$th Stroke.
Scale=$\frac{1}{4}$

VALVE MOTION BY MOTION CURVES.

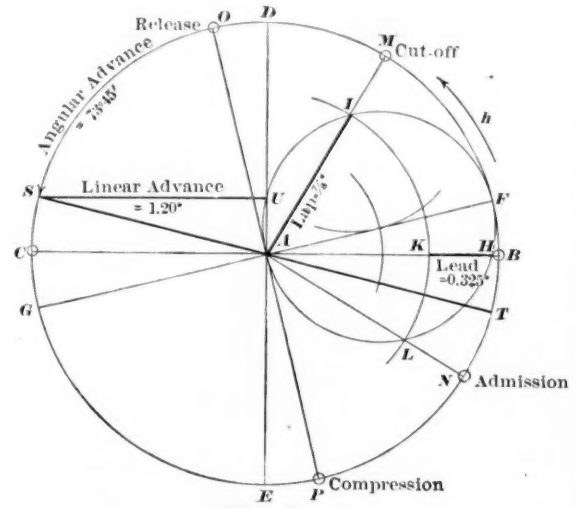


Fig. 2

Diagram of Crank & Slide Valve Motions
Lap $\frac{7}{8}$";Lead 0.325";Travel $2\frac{1}{2}$";Cut-off $\frac{1}{4}$th Stroke.
Scale=$\frac{1}{4}$

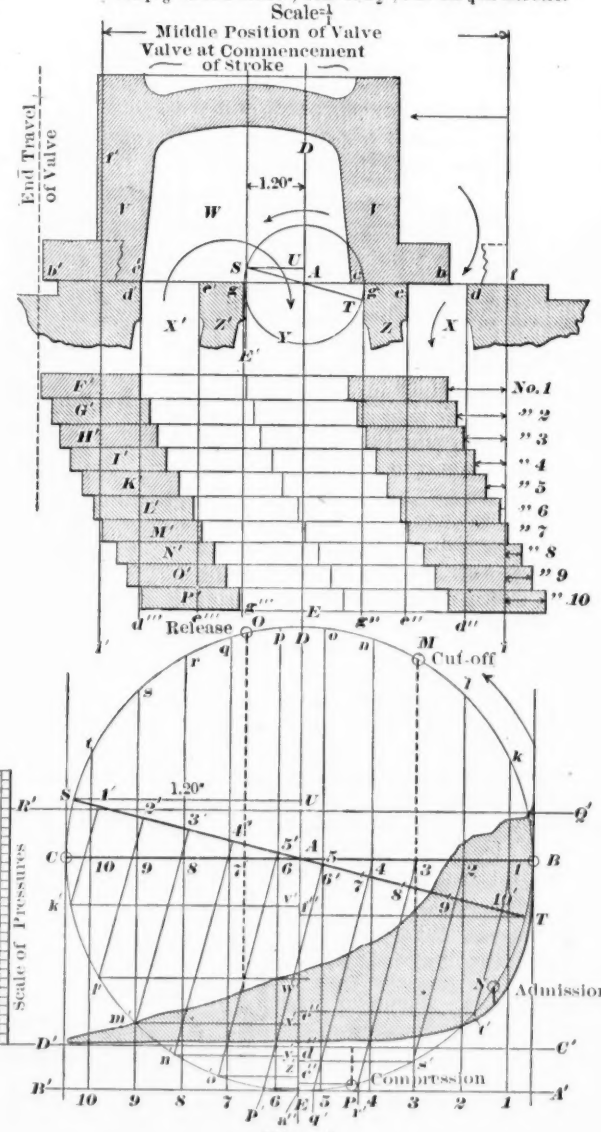


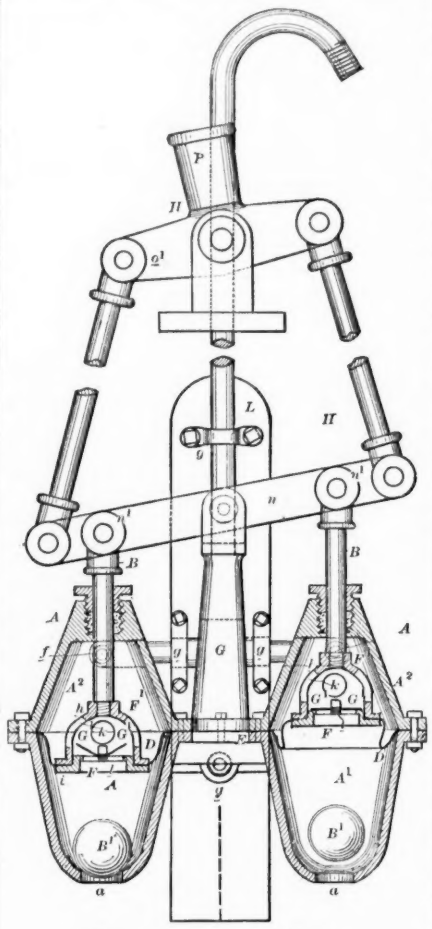
Fig. 4

Cut-off at $\frac{1}{4}$ Stroke
Scale for Valve=$\frac{1}{4}$ Scale for Eccentric $\frac{1}{1}$

TEN SUCCESSIVE POSITIONS OF CRANK AND VALVE.

Novel Submerged Pump.

The engraving presented herewith represents a novel design of force pump. It consists of two cast iron conical shaped sections A^1 A^2, which take the place of barrels in the ordinary pump. These sections have their respective inlets *a*, and outlets *f*. The inlets are covered by elastic ball valves B^1. The pistons or plungers *F*, instead of fitting the bore of a cylinder are attached to the rubber diaphragms *D*, which are secured between flanges both upon the valve boxes *h*, and those upon the conical sections which form the outside of pump. The valve boxes are provided with valves G^1, as well as openings *k*, for the free escape of water. The piston rods are packed in the usual manner by means of a stuffing box, and are each attached to a rocking bar *n*. By means of the pitmans (which may be long or short depending upon the distance from the top of well or tank to the pump) connection is made with the rocking bar *H*, having a socket *P*, for the application of a wooden lever for working the pump. The pump may be easily secured in position by bolting the plate *L*, to a post or other convenient place. The water escapes through the vertical pipe *G*. This pump will pump dirty water without injury to its parts; is free from the friction of pistons working in cylinders, and is furnished at a nominal cost. It is made by John Flanagan, Newburgh, N. Y.



NOVEL SUBMERGED PUMP.

Odds and Ends.

BY F. F. HEMENWAY.

Our mutual friend, Tabor, don't put himself on record very often; but when he does, he has the habit of getting at something of interest. His efforts have built the business end of the indicator away up, but his recent communication demonstrates that he is fully alive to the fact that the indicator has two business ends. Tabor has got the pencil movement down fine, but if engineers keep on increasing rotation, he may have to do more whittling. It really looked, when he got them to change motion to correspond to four hundred or five hundred revolutions, and to do it in a way pleasant to witness, that he might rest at that, and turn his attention to the paper motion. His partial confession of the inadequacy of the drum movement, at high speeds, may encourage others to "speak out" on the subject. The revolution of the paper barrel by a *string* at any speed is bad enough; that is, it is neither theoretically nor practically correct. It was as good as the rest of the old-time indicators, but never equal to the pencil movement of the Richards instrument; and at five hundred or six hundred revolutions is really worthless. I hope Mr. Tabor's criticism covers an intention to reform this altogether. If he can add to his light reciprocating parts a paper motion as positive as that of the engine cross head, and possessing one-half the convenience of the drum, he will deserve a monument from the engineering fraternity. The indicator has been efficient in improving the engine. High rotative speed must now improve the indicator. If it does that, it will serve one useful purpose. Speaking of indicators: If some one would give us a series of diagrams from automatic and compound engines, taken just as they are, working every day, and without special preparations of parts, they would be interesting. A general mention of the kind of valve might be given, and the clearance, if known; but not the names of builders. Mr. Scheffler contributes a pair, or more properly, four diagrams, but fails to attach the scale of the spring—an important omission. Their consideration, from any supposed scale, would seem to imply that the engine or indicator needed doctoring.

* * * * * * * * * *

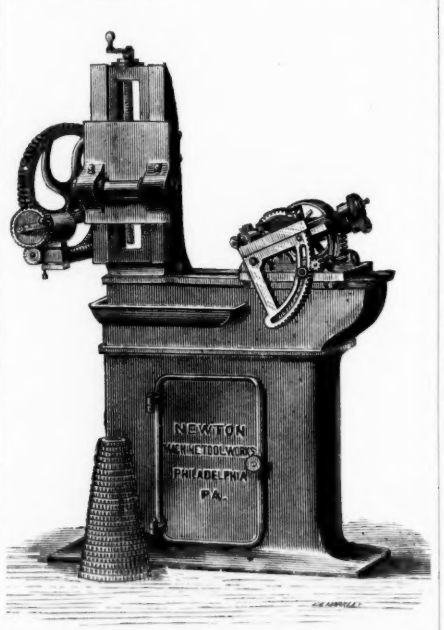
I hope, if there is in the world a man who can measure Chordal for an elastic shop, that man will sacrifice his ambition on the altar of the general welfare of humanity, and forever hold his peace. I hope, if Chordal gets his own measure, and the shop, he will enjoy his triumphs in quietness, if he can enjoy them. No man possessed of such knowledge has any moral right to use it to subtract from the sum total of human happiness. A large part of the world's individual happiness consists in looking ahead to future expansion. The machinist's apprentice looks ahead to the position of journeyman. This looking ahead makes him a good apprentice. He is not a good apprentice for the sake of being one. He knows it is the road that leads to becoming a good journeyman. His pleasure is in the present, but it isn't of the present. If he could expand himself in twenty-four hours by some patent process, he would be deprived of years of happiness—the happiness of contrasting what is *to be* with what *is*. The journeyman looks forward to knowing more, and hence being more. His good time is next year, but he gets his pleasure from the present contemplation of it. Take away the pleasure of this prospective contemplation, and you wreck his happiness.

* * * * * * * * * *

When the proprietor builds a shop, he designs it for present means and purposes. He builds to-day that he may magnify in the future. His delight is not in his present undertaking, but in what it will lead up to in the bye and bye. That bye and bye may never come, but he gets all the pleasure connected with it in the belief that it will. If it does come, and his plans expand into angles, and Ls, he glories not in their present inconvenience, but in future reform. Shut him off from prospective dark corners and unnamable projections, and his happiness is wrecked. Deprive him forever of a prospect of remedying the defects of these corners and projections, and the wreck is made more complete. If he moves heavy castings by sheer muscle, all the misery of the present is swallowed up in prospective cranes and derricks. If he don't see by oil lamps he has visions of future electric lights. His happiness won't come from the possession of cranes and electric lights. It does come from the misery of doing without them.

* * * * * * * * * *

You can't compass a machinist's desires with his surroundings. If he is the proprietor of a lathe that will swing twenty feet, he will block it up to swing six inches more. He won't block it up for the sake of the six inches, but to pave the way for another foot. If his planer will plane thirty feet, he will make a casting eighteen inches longer, and contrive to plane it. His desires have a constant tendency towards something outside his facilities.



AUTOMATIC GEAR CUTTER.

After all, this stretching after something beyond is progress. Progress is not entirely a thing of order. It is more generally made up of angles and turns like machine shop additions. It blocks up lathes and extends planer tables. An absolute failure may represent substantial progress. Its ultimate intention is order. Its present path may be far from it.

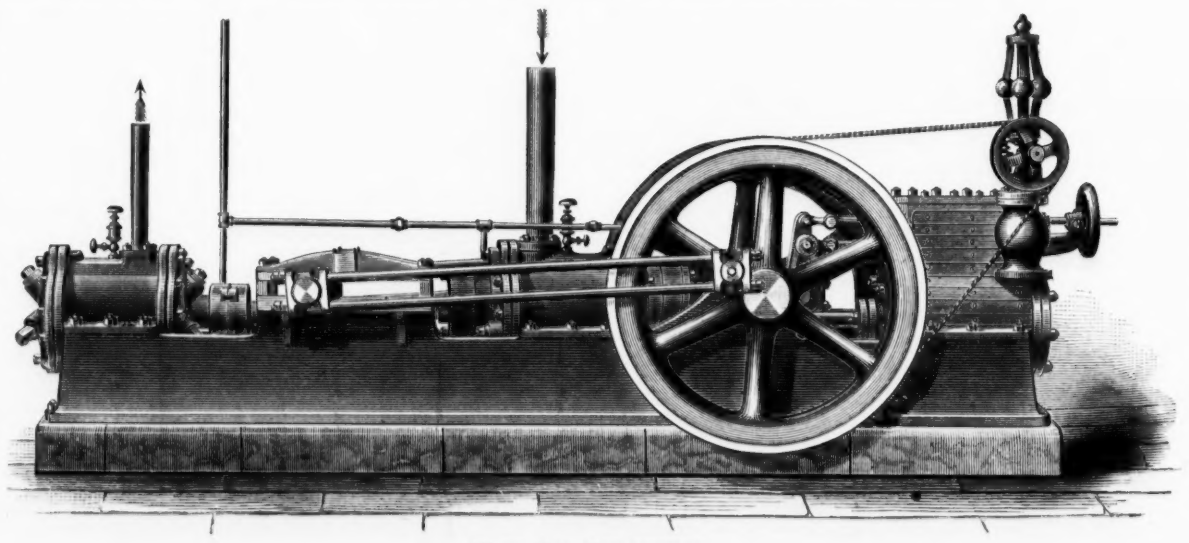
The machinist exercises about the usual forethought, and makes about the usual mistakes in building his shop. He tries to see room to spread out, and has faith in money to buy more tools and supplies, but he faces something against which he is making no effort to provide—the present and prospective lack of skilled labor. He can't make skill of brick and mortar, nor workmen on paper. He has to hammer, and bore, and plane, and turn them out. They must be made in the shop, in a shop manner, and with shop appliances. They must oil their hair with greasy waste, and jam their fingers with monkey wrenches and hammers. Education will broaden them, and render them more elastic, and help them to fit more places, but it won't make them. Chordal's Sackett covered the ground when he said: "No college, or course can make a man a surgical man, even though they endow him with the title of surgeon." Machinists die—sometimes—and they go West," or get disgusted and go to farming, and the supply, like all other supplies, gets low. In fact, it is low just now. The supply of boys anxious to make good machinists is plenty just now. There ought to be an individual wise enough to map out a plan that would compass the transition.

* * * * * * * * * *

I have a letter from a machine-shop proprietor in an adjoining State, inquiring for good machinists. This proprietor employs a hundred machinists (when he can get them) on first-class work. He don't employ any apprentices. Now, I don't know how long the average machinist works at his trade, but assume, say, twenty years, which is probably quite too high. This proprietor must then supply himself with five new ones per year, and, giving him a fair chance at foreign influx, should keep for this purpose ten apprentices, at least. The problem is, how shall he work them to his and their advantage. I can't settle this. I can only make a suggestion. He employs two foremen (his work is all on one floor) and it may be granted they have literally no time to instruct apprentices. It may as readily be granted that ten apprentices will require considerable attention. The suggestion is this: Let him create a new title—say that of instructor—fill the place with a man who is a thorough workman, and, who has some mechanical education apart from the shop, and make it his duty to look after the apprentices. Then put the boys on the same footing as journeymen—retaining the wages honestly due them for extra ability until the expiration of their terms. Of course, it would be an improvement if some facilities were provided them for improvement in the way of study, etc.

Intelligent workmen come up from intelligent boys treated in an intelligent manner.

New Gas Compressor.



NEW GAS COMPRESSOR.

The new gas compressor herewith illustrated has 10 inch steam cylinder and 8-inch inlet cylinder compounded with a 4¼-inch compressing cylinder. It is in use by the Philadelphia & Reading R. R. Co., for compressing illuminating gas to a pressure of 325 pounds per square inch. Steam of 80 pounds is used and cut off at one third of the stroke. The compressed gas is stored in tanks under passenger cars for illuminating purposes. Modifications of this machine are used for compressing ammonia and other gases (ammonia becomes liquefied at about 200 to 225 pounds pressure). This compressor is built by the Norwalk Iron Works Co., South Norwalk, Conn.

Canton, O., manufacturers provide employment for over 3,000 employes, with a product of about $7,500,000.

Newton's Automatic Gear Cutter.

One engraving on the opposite page represents an automatic gear cutter, which is made at the Newton Machine Tool Works, 2,341 and 2,343 Callowhill Street, Philadelphia, Penn. This machine very much resembles, in its general appearance, a gear cutter which was illustrated and described in the American Machinist of Sept. 4, 1880, and has an automatic feed and a quick return motion to the cutter. There are three sizes now made, viz., No. 1 cuts gears up to 30″ in diameter, No. 2 to 40″ in diameter, and No. 3 to 60″ in diameter. This machine will cut either spur or bevel gears, and has change wheels for all pitches liable to be required.

LETTERS FROM PRACTICAL MEN.

Brackets for Planer Bolts, Washers, and Tools.

Editor American Machinist:

A great number of your readers are aware of the ways in which tools in the majority of machine shops are to be found. I think it will not be out of place to state that they are to be found here, there, and everywhere, as a general rule. There seems to be the least attention given to considering how the workman can work to the best advantage. How often the workman wishes to find a strap, bolt or washer, for a certain piece of work, and knows not where to look for it. Sometimes they are found under the bench, or in a box with straps, nuts, washers, and, generally, turnings from the lathe. Such has generally been the case in the shops that I have worked in.

The upper engraving shown herewith represents a very convenient and simple form of cast-iron bracket intended to be bolted against the shop wall. The openings are for the reception of tools, the flange at the edge preventing the tool handles from slipping out. This forms a very convenient form of rack for different lengths of planer and lathe bolts, placing the longest at the left hand, and the shortest at the right. By this plan a person can select the bolt desired in an instant.

The lower engraving represents a very good bracket for washers, and consists of a cast iron plate, having holes for the insertion of wooden pins. The plate is to be attached to the wall, and the pins inserted.

These pins are of different sizes, to suit different-sized washers, and will be readily understood from the engravings.

I have had the patterns for the past five years, and have introduced them into a number of shops, and I will say that the verdict has always been that they are just what has long been wanted. The usefulness to which they can be put to will, without a doubt, be seen by the practical mechanic.

C. E. Simonds.

London St., East Boston, Mass.

A Dephosphorizing Process in Litigation.

Editor American Machinist:

In No, 10, Vol. 4, of the American Machinist, page 7, may be found a translation from a French journal, headed "New Process for the Dephosphorization of Iron."

Many persons have asked me to explain this new process, and to save time in answering the questions by letters, I beg of you to publish this general explanation. The Basic process (in the translated note called the Gilchrist-Thomas system) is conducted in a lime-lined vessel, and in the presence of a basic calcarious slag, while the old Bessemer process is conducted in an acid-lined vessel, and in the presence of an acid slag. In the practice of the basic dephosphorizing process, the combustion of the silicon which the metal contains produces silicic acid, which not only tends to wear away the lime lining, but its presence in the slag is detrimental to the most perfect dephosphorization of the metal.

The new process referred to was designed to obviate this difficulty, and is conducted as follows: Two converters are used, one of which is an acid-lined vessel, such as now used in ordinary Bessemer practice, the other vessel is lined with lime or other basic material. Molten iron is run into the acid-lined vessel, and blown until the carbon and silicon are eliminated. The metal is then emptied out into the basic-lined vessel, the acid slag being excluded. The metal is then blown from one to five minutes, or until the phosphorous is eliminated. It will be seen that the new process is the combination of the Bessemer acid and the basic processes.

It is hardly fair to say that Osann is the inventor of the new process, as the invention is involved in the case known as Thomas *vs.* Reese, Osann and Harmett. It has once been decided in my favor, and the patent granted to me, but the patent before issued was recalled, and a new interference declared, which is still pending. This case has been pending now nearly two years, and will probably be finally determined during the coming summer, after which it will be known whether it is a German, French, English, or an American invention.

Jacob Reese.

Pittsburgh, Pa.

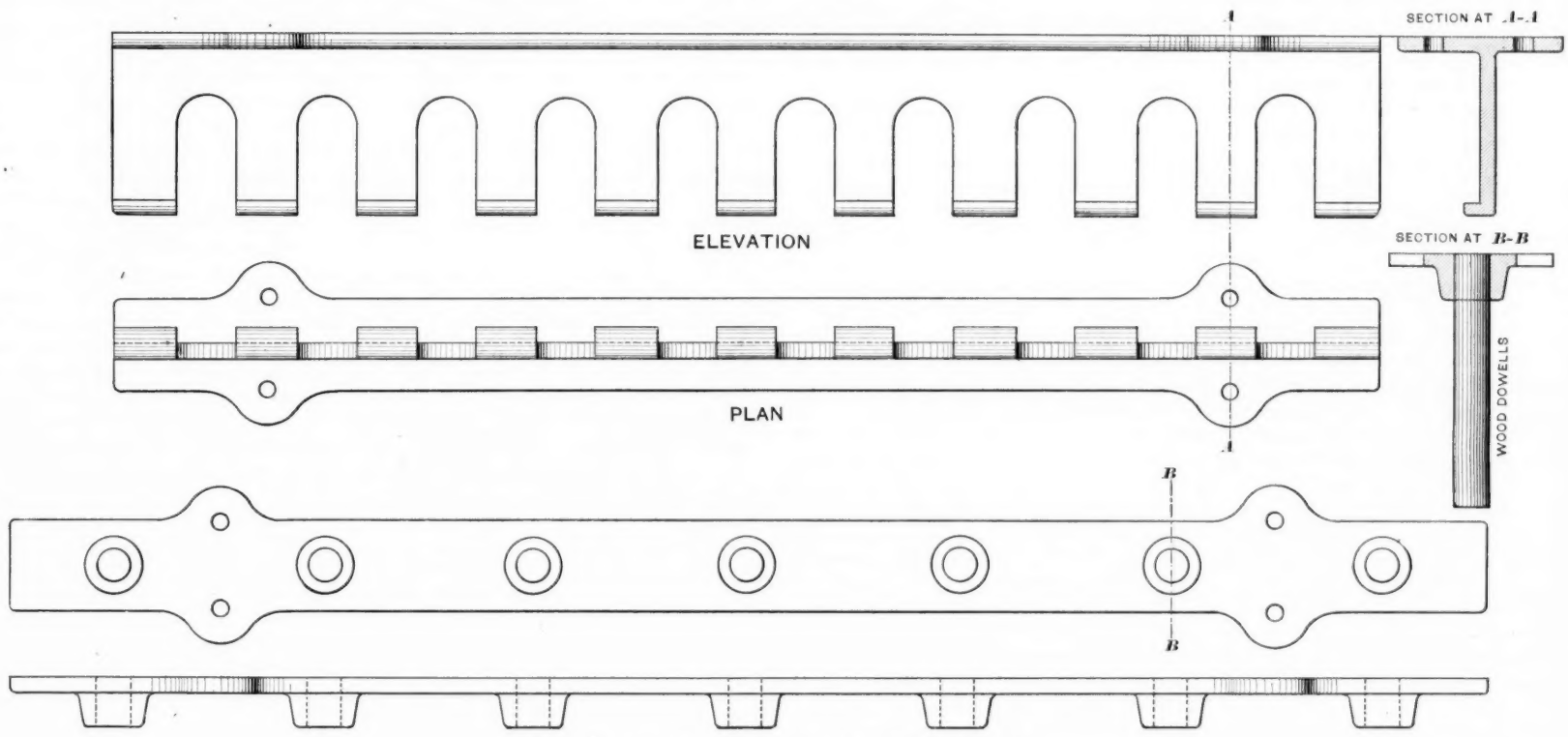
Does it Stop?

Editor American Machinist:

Every veteran machinist will revert with pleasure to the many amusing incidents crowded into the last ten minutes of the shop dinner hour, when in the little groups seated on blocks, boxes, and trussels, questions would be sprung, which would seem to reduce the remaining minutes to seconds.

It was in one of these assemblies that the above question was asked by one of the graduating apprentices.

It was put in this way: "If all the joints in the connecting rod of an engine are keyed close, and the main box made to fit closely, will the cross head or piston stop at the end of each stroke, or can they be said to be constantly moving?"

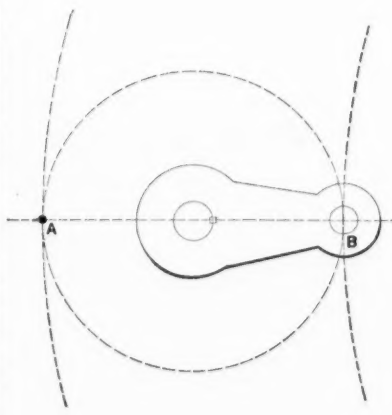


Brackets for Planer Bolts, Washers and Tools.

The question was not satisfactorily answered then, and, I believe, has never been since.

While this question, like the 13-15-14 puzzle, has no vital principles involved, it may be of interest to some who think upon cranks and cross heads.

I will not venture an opinion on this now,



but am free to say that the piston comes nearer stopping at the outer center than it does at the inner. The reason for this is obvious. If, however, it is needed, the sketch will illustrate.

The shorter the connecting rod in proportion to the crank, the greater will be the difference in the motion at the two centers. The two arcs at *A*, only differing in degree, will come much nearer bringing the cross head to a rest than will be the case at *B*, where the radius of rod and crank is at variance.

This varying movement is readily seen in indicator cards taken from the two ends of a cylinder, having the usual *D* slide valve.

This is compensated for in some degree by some builders, by giving the valve unequal lap at each end; a somewhat more vital question than the first-named, and one I have never fully investigated.

Quirk.

Chattanooga, Tenn.

Steam Launches for Pleasure.

Editor American Machinist:

I am led, after a perusal of your note on the first page of a recent issue, concerning the "hundreds of men in our maritime cities who would purchase steam launches for pleasure were they manufactured and sold at cheap rates," to make a few observations concerning the same, from an experimental point of view. I propose first, with your kind permission, to note the capacity of the launch in my possession and also with this the requisites demanded by the Government—for the idea prompting this communication is not the first cost of the launch, but is to show that the Government restrictions cause the lack of increase in the number of steam launches in our city harbors. The boat is 19 feet long, 6.5 feet wide, with an average depth of 30 inches. I have fitted this boat with one high pressure engine, 4.5 inches cylinder diameter, and 4 inches piston stroke; also with one upright tubular boiler of the following dimensions: height, 23 inches; diameter, 24 inches. It has 112 one and three-quarter inch tubes. The boiler has drilled holes, and is double-riveted, with allowable pressure of 133 pounds to the square inch. The first cost of this launch was $200, and every part of it is first-class. When we purchased the iron in anticipation of building the boiler, the law demanded that we notify the proper inspecting authorities. We did so, and they took part of a boiler plate for inspection. At the completion of the work we were again obliged, before we were allowed to run the boat, to notify the inspectors a second time. They came and inspected the boiler, and imposed certain inferior restrictions, against which we found no fault; but when the bill of inspection—$25.00—was presented for payment, we paid it with some reluctance, especially from the fact that the steamer "Massachusetts" (for instance), 357 feet long, 80 feet wide, with four decks, plying daily between this port and New York, when having her boilers inspected, is charged the same sum, $25.00, and no more. In short, the same laws governing a steamer of the most massive proportions, are applied to a vessel run by steam, even if capable of

carrying but one person. Now, Mr. Editor, is this what may be termed just legislation, and do you wonder that people refuse to buy, for pleasure, steam launches suitable for their purpose, when in a few years they are absolutely obliged to hand over to the boiler inspectors the value, or more than the value, of the vessel? RUFUS G. FAIRBANKS.

Providence, R. I.

Mac's Gear-Cutting Attachment.

Editor American Machinist:

I have been studying Mac's new way of cutting gears on a common engine lathe in your issue of Aug. 16th, and I think it would mark about as well as other devices in its line—would not work at all in fact. How would Mac feed his cutter through the tooth? He would get a handsome thing by using the adjusting screw alone, and if he can cut a straight space by using both adjusting screw and feed screw, he is a wonderfully smart workman. After he has cut his tooth, such as he can, he would be puzzled to shift his gear block around for the next tooth, and I cannot conceive how he can contrive even to botch that part of the job. The cheap and easy way to cut gears, by an attachment to the ordinary lathe, has yet to be invented, and would be worth a patent. GEORGE G.

Boston, Mass.

Cutting Gears and Tapers.

Editor American Machinist:

Your correspondent, "Mac," gives us a crooked engine, by way of illustrating his article, which should have been headed, "How to do crooked work?" 1st. "Will the planer move the work, weighing a ton or more, while the little tool stands still?"

We are inclined to think it will, for this reason: that to build housings, uprights, and traverse gears, sufficiently firm and heavy to carry the tool over the works, would require the machine to be of ponderous weight; while the work to be done might be upon a piece of a ton weight, or upon one weighing less than a hundred pounds.

"And how to cut gears on a lathe." I am glad "Mac" has not patented that arrangement, for, unless as an improved way of botching, I don't believe it is worth patenting.

In what way are the divisions of the gear to be made? How, unless by a tedious turning up and down of the elevating screw, are you to get a cut parallel to the hole in the blank?

And now comes the "taper attachment;" "a little calculation, and a grade of wheels, etc., will enable one to turn most any kind of a taper." Precisely.

"Chordal" tells of a fellow who bored out taper holes by whistling a tune of $\frac{9}{16}$", or more taper to the foot, and turning the cross-feed screw in time to the music.

That is altogether simpler than "Mac's" rack and pinion business, and an improvement on the string and pulley.

I trust, that in these days when good and handly lathes for taper turning are so common, and while Brown & Sharpe make *automatic* gear cutters, and while every clear-headed man knows that, to resort to any old-exploded "pod auger plan" for doing work is a sheer waste of time and money, and a direct encouragement to *botching*, that "Mac" will forego the pleasure of getting any of his inventions *patented*. Most workmen, when starting to turn a taper, want to know something about what the *taper* will be, unless "*most any kind of a taper*," will do. KNOCK AWAY.

Gananoque, Ont.

Position of the Wood Turner.

Editor American Machinist:

I have been taking your paper for quite a while, but being a poor scholar, I did not like to intrude; nor would I now, but in reading Mr. Quirk's communication, entitled Random Raps at Practical Men, I find he greatly underrates wood turners. He evidently confounds the cheap furniture factory turner with the regular out and out turner. I worked at the machinist's trade when I was a boy; afterwards, I learned wood turning, and have worked at it for twenty-one years. I can turn a bed post in five minutes, and I can, on the same lathe, turn a billiard ball, or a pattern, to an accuracy that cannot be beaten by a machinist on an engine lathe, and I know many others that can do the same. In Detroit, and other places in which I worked, I have seen very difficult patterns brought to the turning shops to be turned. A man that can call himself a turner should not stick at any job, large or small, no matter how accurate work may be required.

I think Mr. Quirk has no correct idea of wood turning. "CHISEL."

West Bay City, Mich.

Varnish for Patterns—Suppressing Independent Thought.

Editor American Machinist:

Your correspondent, "Lampblack," seems to have placed an erroneous construction upon my remarks in regard to varnishing patterns. I did not claim that yellow varnish was the best, or that its use rendered patterns less impervious to moisture than black. I advocated the use of yellow varnish as a means of improving the quality of our work. I take it to be the experience of most pattern makers that when they have predetermined that their work shall be black varnish they are less careful in the manipulation of such work than they would be were they obliged to use yellow varnish.

Putty joints and wax or putty fillets, etc., may be concealed by lampblack and alcohol. But with such defects in pattern work, yellow varnish would be an eye sore to a pattern maker who takes pride in his workmanship, and a continual source of annoyance to the moulder. I trust I have said sufficient on the subject to convince "Lampblack" that I have no intention of upholding a fallacy—in fact I do not intend to be an instructor, having merely attempted to give such hints as I have found by experience to be of use in the trade.

I have been much interested in the comments made by your various correspondents, upon the lack of independent thought among mechanics, and the scarcity of really good workmen. I have thought, perhaps, the pernicious system or habit practiced by many manufacturers of placing over their employes men deficient in all previous mechanical training may, in a measure, account for the vast number of inferior workmen.

Their superintendents and foremen often secure situations through family influence, or by underbidding better men, than through any merit they may possess as practical mechanics. Such men owing their positions to such means are not the ones to encourage independent thought, or to elevate the present standard of workmanship. On the contrary, should one of their workmen manifest a disposition to think for himself, he is soon given to understand that it is not conducive to long jobs to know too much. Should he still persist in exercising the right to use his brains, his resignation is speedily requested. No; the men most appreciated by such bosses are of a class known in shop parlance as "suckers"—fellows who bid twenty or thirty per cent. below the current rates in order to secure a job, and then depend upon their cheek and servility to retain it. Presents and bribes are often added to make themselves more solid. Such libels on mankind often crowd out good men, who cannot descend to such despicable means to keep a job. Good workmen need to be encouraged and appreciated. What is the use of their putting thought and intelligence into work for employers who are too indifferent to recognize it, and who place over them men who prefer servility and "divvies" to honest and intelligent effort?

SANDPAPER.

Brooklyn, E. D., N. Y.

The New York and New England Railroad has limited the time for the completion of its extension to May 1, and it is expected that regular through passenger trains will be running by May 15. All the depots between Waterbury, Conn., and Brewsters, N. Y., are ready for business.

Extracts from Chordal's Letters.

MR. MARLING THE MOULDER.—HIS INDUSTRIAL AND SOCIAL HABITS.—HIS EFFORTS TO MAKE HIS CO-WORKERS MISERABLE.—HOW THEY APPRECIATED HIS EFFORTS.

Mr. Editor:

* * * * Mr. William Marling is a moulder. He is a very common moulder and does only the commonest kind of work. It cannot be charged that he has a soul above his business. Somebody might raise the question whether it could be proven that he has a soul at all, or that he has any idea that he has a business. I think he confines himself to the idea that he is a moulder.

Mr. Marling is not the kind of a man to make anything but a moulder out of—anything but the very commonest kind of a moulder, I mean. It was a happy thought which suggested to Mr. Marling the choice of a vocation, supposing, of course, that he thought some before choosing. With a full knowledge of Mr. Marling's intellectual, moral and social qualities, in case I had been appealed to to select his vocation I should have set him to work in the moulding shop, provided I could see plenty of very common moulding to do, so that his energy would not outrun his supply of work, and providing I cared nothing for the other moulders, who would thus be favored with Mr. Marling's company.

With such a grade of moulding as would call for special skill, or special anything, in view, or with a care for the moulders already at work, I hardly think I would have recommended the foundry to Mr. Marling, or Mr. Marling to the foundry, rather.

* * * * Mr. Marling is not only the commonest kind of a moulder, but is also a painfully common kind of a man.

As a moulder there is but little in Mr. Marling which draws him toward, or appeals to, the warm and sympathetic feelings of other moulders. When Mr. Marling gets burnt in the foundry the other moulders seem to feel just about as they would if Mr. Marling had not been burnt. When Mr. Marling mashed his nose by stumbling over a shank ladle, no one seemed called upon to think of arnica till the owner of the shop came in and saw the nose; no moulder thought of going after arnica till the owner went himself, and when the owner and arnica came back, no moulder thought of rubbing the arnica on the nose till they saw the owner doing it. They thought Mr. Marling would rub the arnica on his nose himself; that is if they thought anything about Mr. Marling at all.

The owner of the shop was a moulder and might have many reasons for ministering to Mr. Marling's mashed nose, but I think he had no reasons which the other moulders didn't have. Maybe the owner was a little warmer, or a little quicker, or a little smarter, or a little broader in the mind than the other moulders. Maybe that would also account for his, instead of the other moulders, owning the shop. Who knows? It don't make any difference anyhow. Somebody had to own the shop or else there wouldn't be any shop; and if there were no moulding shops what would the moulders do, and what particular trade would Mr. Marling have been forced to choose?

* * * * Mr. Marling is about forty years old. He has been working, or occupied rather, at his trade of common moulding for about twenty-five years. During that long twenty-five years he has never brought into the moulding shop a single idea which would tend to advance the moulder's trade, or an idea which would tend to advance the joys and pleasures of a moulder's life, or an idea which would in any degree add to the happiness of a moulder's wife or a moulder's children. I know moulders who go to work in a moulding shop and give a new tone to the sandy atmosphere around them. Moulders change in life and character when these men come into contact with them. When they go there is real hand shaking with something in the touch of it, and there are thoughts remaining. Mr. Marling is not that kind of a moulder.

* * * * If an association with Mr. Marling has any effect at all on his fellow moulders, it is to make them less happy. If a moulder has hopes in life; if he finds a certain pleasure in labor; if he goes home nightly to a home of his own, and has his fun with his wife and babies; if he sees the comfort and pleasures of these gradually increasing as the accumulation of his labor increases; if the little wrinkles in his face are all wrinkles of general good will to all who live: these things are not bettered one whit after contact with Mr. Marling.

If he has hopes, Mr. Marling tells him to give them up. If he can be pleasant while he works, Mr. Marling tells him never to be gay at a funeral. If he steps lightly towards his front gate, Mr. Marling sours him by pointing to somebody else's gate, which is a bigger gate. Mr. Marling changes the wrinkles in moulders' faces.

* * * * Notwithstanding nobody cares for Mr. Marling, Mr. Marling has an effect wherever he goes.

Mr. Marling carries his sole possessions in a very poor sort of a satchel.

Mr. Marling has worked twenty-five years, but he has no nice moulding tools. He has no nice clothes. He has no nice home. He has no family. He has no books, no watch, no fiddle, no nothing. He has no parents, or brothers, or sisters, or close warm friends. He has never been troubled with sickness.

It seems sad to work in a dirty moulding shop for twenty-five years and then only own a trowel, two slicks and two ratty suits of clothes. It seems sad not to have any ties or hopes in the world. But this is the case with Mr. Marling. Mr. Marling's efforts to make himself a miserable man, a serf, a slave, a specimen of all that is unpleasant, seem successful in themselves, but Mr. Marling has a mission which extends beyond himself. Mr. Marling's effort to produce certain conditions seems to take in all the moulders. Mr. Marling is generous with his misery. He has had experience in turning human life to nothing, and he proposes to have all other moulders understand the art. In this transfusion of ideas Mr. Marling is more successful than he is in common moulding. He seems to have devoted more of his mind to the former work. True, he gets paid for his common moulding, and gets no thanks even for his earnest efforts at making moulders sick of life. His is a labor of love.

Love of what? It's hard to tell. If Mr. Marling sees a moulder with a home and pleasures and worldly goods and hopes, Mr. Marling tells him that he should have everything in an ugly satchel so he could growl at fate.

Mr. Marling thinks his own condition the normal condition of a true moulder, and when he sees a moulder who seems to have been born into the world to live he proceeds at once to treat this abnormal case.

* * * * When Mr. Marling goes to work in a moulding shop he at once assumes charge of the miseries of all the moulders. If he finds a foolish moulder with no miseries, he lends him a stake and shows him how to increase it. He lays out all the work for the men. Before he has been in a shop three days he has told every man just how much work he should put up per day. The men don't care for Marling, but there is something about him which stays by them and goes home with them and mixes into their home life.

They can wash facing dust off their bodies, but at home they find a marling kind of a something about their persons which won't rub off. It is unpleasant to wife and children, but it stays. Besides portioning out the work for the men, Mr. Marling sometimes undertakes the adjustment of wages. Long as I have known Mr. Marling I have never known him to increase a moulder's pay. He devotes himself to reductions. If a moulder earns a little too much money, Mr. Marling will commence on the matter at once. The generous Mr. Marling wants all moulders to partake of his own miseries and to work for his own pay. * * * * The idea of Mr. Marling

making an individual effort to increase his own pay would seem queer to any one who knows him. An underpaid moulder is Mr. Marling's delight. A well-paid man is his abomination.

Point out to Mr. Marling a moulder earning good wages, and you will see pain pictured on the face of misery. Soon, however, the pain will give way to pleasure, for he has labor before him—a labor of love. Love for what ?

* * * * On several occasions Mr. Marling has made efforts to raise the pay of moulders, but when he found out that certain moulders took advantage of such increase of pay to surround themselves and their homes with more of the good things and good feelings of life, he saw that he was working in the wrong direction. Mr. Marling talks "live and let live," but a moulder must be very careful how he lives in Mr. Marling's view. Once Mr. Marling struck a shop where every moulder in it owned a house and lot, and had it all paid for. Then Mr. Marling was in real pain, but he set to work manfully. He pointed to these moulders pictures of the most finished misery and discontentment. He commenced to regulate the amount of work each should do. He found one man getting a nickle a day too much, and he tried to fix it.

He pointed to his own example and invited them to follow it by heeding his words.

But it was all no good. These foolish prosperous moulders not only would not be taught by the experienced Mr. Marling, but they incontinently kicked him out of the shop and out of the town, and hustled his satchel and his trowel and his two slicks after him.

Mr. Marling thinks there are some queer moulders in this world.

* * * * Very respectfully,

CHORDAL.

Contracts have been let in Cleveland for the construction of the New York, Chicago and St. Louis Railroad. The contract for the section between Cleveland and Buffalo was let to J. S. & T. D. Casement, of Painesville, Ohio, who bind themselves to have it finished at the earliest possible moment. The Casements are old railroad builders, Gen. Jack Casement having been one of the chief contractors on the Union Pacific. The section west of Cleveland, and terminating at Tiffin, has been let to R. G. Heaston & Co., of Cincinnati. The contract for the section from Tiffin to Fort Wayne, Ind., has not yet been let. Over two millions of ties, and forty thousand tons of steel rails have been contracted for by the company.

The New Jersey Labor Bureau recently sent out circulars to 1,000 persons in the State, asking their opinion as to the probable result of a general reduction of the hours of labor to eight per day. To this 919 replies were received, 608 favoring, and 301 opposing such reduction. The former generally favor it on the ground that it would bring about a physical improvement in the condition of the working man, giving him more leisure and enabling him to live further away from city centers.

Farm laborers' wages throughout New Jersey average from ten to twenty per cent. higher than this time last year.

The recently established Alabama Board of Railroad Commissioners are agitating the project of holding a Congress of State Railroad Commissioners, this summer, and suggest Louisville, Ky., as a central point for meeting. The idea is to discuss all phases of the matter of regulation of railroads, and to agree upon some statute governing the same, to be submitted to the various State Legislatures. Such Congress might well be productive of good.—*Railway Review.*

One of our scientific exchanges says: "The crows are flying northward, which indicates an early spring."

Foreign Technical Notes.

Translated for the AMERICAN MACHINIST.

NEW REGULATOR FOR MOTIVE POWER ENGINES.

The *Moniteur Industrielle* gives an elaborate description of a new dynamometrical regulator for motive power engines, invented and patented by M. Moussard, Paris. The peculiarities of this new regulator are that on the main shaft of the motor, at the side of the fly-wheel, is mounted the driving pulley, secured to the fly-wheel by springs, which, by the variations occurring in the resistance caused by stopping or putting into action machines, or by any other cause, are compressed or relaxed, and an angular movement is consequently given to the pulley. This differential or rather dynamometrical movement of rotation is here changed into a movement of translation following the axis of the main shaft, by forming a rack which is concentric with the main shaft on the end of a lug projecting from each of two opposite arms of the fly-wheel. Into each rack gears a toothed sector, which by means of a second sector, conveys the differential or dynamometrical movement in a line above the shaft, the two sectors being fixed on a spindle mounted in bearings fixed on the driving pulley mentioned above. The oscillation of the second sector imparts a to-and-fro movement to a sleeve mounted on the main shaft, and connected again to a lever pivoted to a rod hinged to the frame of the motor. The movement of the lever is transmitted by a rod to a valve, and in this manner is regulated the admission of steam or gas. When it appears desirable to remedy the irregularities of the power, a small cylinder with a piston is fixed on the frame of the motor, and is in communication with the boiler or generator by a pipe. The piston-rod bears against another lever which is jointed to the frame, and a spring, which is in equilibrium of the determined pressure in the generator, constantly solicits this lever towards the corresponding or equilibrium position. The oscillation of the last-mentioned lever, caused by the variations of pressure in the generator, are transmitted to the first mentioned lever, which is pivoted to a rod, by means of other levers. There is, therefore, still the one direct, instantaneous action of the pressure in the generator on the admission, an action entirely independent of that given by the variations of the resistance. Altogether, therefore, this arrangement constitutes an auto-regulating dynamometer and has up to the present given the highest satisfaction.

SPIRIT LEVELS.

In the last number of *Comptes Rendus* it is recorded that M. Plantamour has made some observations upon the displacement of the bubble in spirit levels, and found that there was a daily maximum during the afternoon, accompanied by gradual changes, which extended over a period of several successive days. In confirmation of his observations, M. d'Abbadie reported his own experience at Olinda, Brazil, in 1837; at Gondar, Ethiopia, in 1852; and subsequently at Saga. At each of these places the bubbles of the levels showed small variations in the direction of the plumb line. There is no doubt that astronomers have often suffered from these changes, without being aware of their cause, and have been obliged to mark them by taking the means of frequent observations.

MAGNESIUM STEEL.

In the last *Berichte d. Chem. Gesell.* it is stated that a half per cent. of magnesium changes coarse-grained into fine-grained steel, and greatly improves the quality. The magnesium is introduced through an opening in the cover of the crucible, after inserting some small bits of charcoal in order to remove the free oxygen. Without this precaution there would be danger of an explosion.

TRIPOLITH.

Das Schweiz Gewerbe-Blatt, published at Zurich, Switzerland, says that a new material, which has received the name of "tripolith," is being made by Messrs. Schenck Bros., Zurich. For some time the German Government has encouraged the production of a cement or plaster, which will be stronger than Plaster of Paris, but of a better color than Portland cement, a material to take a place between these for plastering and all kinds of ornamental purposes. The material made by the above firm is said to be of a slightly warmer tone than the gypsum plaster, while it, at the same time, sets more rapidly, is of less weight in the cast (though it should be mentioned that it is admittedly heavier before mixed with water, cast and dried), and of at least one hundred per cent greater strength. It will stand washing with soap and lye, and becomes very hard with age, especially when coated with oil paint. As a material for the plaster fronts of houses, for which purpose plaster is so largely used in many continental towns, it would seem to present the most desirable quality of being unaffected by exposure to the weather. It is used either with an equal quantity of fine sand, or, one of tripolith, one lime, and one fine sand; or one of tripolith to two of coarse washed river sand; or one tripolith to one lime. For water and fire proof coatings, the first and third of these mixtures are especially recommended.

ELASTICITY OF CARBON RODS.

Wiedmann's Annalen says, that Herr Holtz has been able to measure the modulus of elasticity of rods of carbon used for the electric light (Carre's, of Paris) by the acoustical method—the rod being held in the middle with two fingers, and stroked lengthwise with two other fingers on which colophonium has been rubbed. The modulus increases with the density, which is, as a rule, greater in the thinner rods. The tone of thin rods alters a good deal, on repeated rubbing, through heat being generated. On an average, the modulus is equal to that of lead. As to the proved increase of electric conductivity of carbon rods with rise of temperature, Siemens has tried to account for it by supposing allotropic modification (as is probably the case with selenium). Herr Holtz, however, shows, that pyrolusite, a metallic oxide, behaves similarly; but such an explanation would not here apply. Nor does pyrolusite conduct as an electrolyte—there is no polarization. For carbon, Herr Holtz adheres to his hypothesis (of closer pressure of molecules caused by heat, improving the conduction), in default of a better.

Newly Incorporated Companies.

NEW YORK.

The American Electric Light Company, New York; Elisha W. Adams, Edwin M. Fox, William Richardson, Henry Traphagen and William E. Huntington, incorporators; Capital, $500,000. For the manufacture, sale and license of electric lights, and machines for generating electricity for illuminating and other purposes.

The Brighton Pier and Navigation Company, Gravesend; John E. Hoffmire, John Englis, Andrew R. Culver and others, incorporators; Capital, $250,000. To build, equip, furnish, fit, purchase, charter and own steam, sail and other boats, ships or vessels, to carry passengers and freight upon the rivers and lakes of this State.

Stoner Pneumatic Elevator Company, New York: Enoch W. Page, Horace Little and John B. Stoner, incorporators; Capital, $1,000,000. To manufacture and sell machinery and apparatus for elevating and delivering grain, under patents granted to Jno. B. Stoner.

The Goodrich International Propeller Company, New York; Joseph Goodrich, Lemuel H. Wilson, L. Van Wyck, Henry Cornett, C. M. Bolen, Henry L. Niles and George A. Sparks, incorporators; Capital, $10,0.0,000. To manufacture and develop the new invention of Joseph Goodrich, and apply goods so manufactured to water crafts, mills, and the ventilation of buildings.

Boston, Hoosac Tunnel and Western Railway Company; William L. Burt, Elias Howe, Wm. Foster, Jr., E. C. Benedict, Chas. G. Francklyn, W. R. Garrison, David B. Hatch, E. B. Phillips, Myron P. Bush, Wm. V. Burt, George I. Post, Enos Wilder and Josiah Case, directors; capital, $25,000,000. New corporation formed by consolidation of Boston, Hoosac Tunnel and Western Railway Company; Hoosac Tunnel and Saratoga Railway Company; Utica and Syracuse Air Line Railway Company; Syracuse, Chenango and New York Railroad Company; Syracuse, Phœnix and Oswego Railroad Company, and the Mohawk and Lake Erie Railroad Company.

New York, Lackawanna and Western Railway Company; amended articles of incorporation; Samuel Sloan, Jno. I. Blair, Elias S. Higgins, George Bliss, Percy R. Pyne, Wm. E. Dodge, Benj. G. Clark, Jay Gould, Sidney Dillon, Russell Sage, Solon Humphreys, Jno. F. Dillon, Walter S. Gurnee, directors; capital, $10,000,000. To construct, maintain and operate a railroad, commencing in the city of Binghamton and running thence into and through the counties of Broome, Tioga, Chemung, Steuben, Livingston, Wyoming, Genesee and Erie, to and into the city of Buffalo to the International Bridge, thence to Niagara River to connect with the Suspension Bridge; also a branch from main line, running through counties of Livingston and Monroe, to and into the city of Rochester; length of road about 300 miles.

The Mayall Underground Telegraph Company, New York; Alfred H. Mure and Wm. F. Loper, 14 Wall St., New York, and Chas. F. Peck, District of Columbia, incorporators; Capital, $600,000. To manufacture materials, pneumatic tubes, insulated wires, and all apparatus and appliances used in connection therewith for telegraph lines, above ground, or under ground or water.

Compressed Air Locomotive Company of the United States, New York; James R. Keene, Jos. S. Moore, Conrad N. Jordan, J. Sanzada, and Richard Ten Broeck, incorporators; Capital, $100,000. To manufacture, sell, run, and grant licenses to use pneumatic tramway engines, or air-locomotives and compressors.

Central Refining Company (Limited), New York; Prelate D. Barker, Wm. Gaston, John J. Barker, Alfred B. Thacher, and Wm. W. Green, incorporators; Capital, $50,000. To mine, purchase, transport, refine and sell crude petroleum and its products, and to manufacture and sell tin cans and other articles used in connection therewith.

NEW JERSEY.

The Winfield Manufacturing Company, Paterson; Albert D. Winfield, Charles H. May and Samuel Thorp, incorporators; Capital stock, $20,000. To manufacture and sell braids, bindings, cords, and all other silk and cotton goods, etc.

The Chester Construction Company, Camden; Hiram V. Reed, George F. Work and George Lawton, incorporators; Capital stock, $300,000. To build, construct and erect railroads, bridges, steamboats, telegraph lines and other public works, and the manufacturing and constructing of all kinds of machinery, tools, implements, and the buying and selling of iron, steel, etc., etc.

The Oak Cliff Railway Company; Bird W. Spencer, A. R. Macdonough, R. F. Stockton and Cortlandt Parker, incorporators; Capital stock, $100,000. To build and construct a railway from the northern terminus of the Hoboken Land Improvement Company's railroad to the northern boundary of the cattle yard of the National Stock Yard Company at Oak Cliff, a distance of about 2 miles.

ILLINOIS.

The American Refrigerator Transit Company, East St. Louis; B. W. Lewis, Thos. E. Tutt and others, incorporators. Capital, $500,000. To manufacture cars for the transportation of perishable property between all points within the United States or the Dominion of Canada.

Chicago, Pekin and St. Louis Railway Company, Chicago; J. L. Penfield, W. B. Judson, E. S. Barrows, C. J. Eddy and T. C. Smith, incorporators; Capital stock, $2,500,000, in shares of $100 each. To construct a railway from a point at or near Pekin, in Tazewell County, Ill., to a point at or near Grafton, in Jersey County, Ill.

Chicago Newspaper Union, Chicago; Charels E. Strong, Henry M. Pollard and Edward Nolden, incorporators; Capital, $80,000. To manufacture printers' material for printing, and for publishing of newspapers.

Great Western and South Transatlantic Transportation Company, Chicago; John N. Jewett and Robt. Forsyth of Chicago, and Peter Papin of Port Royal, South Carolina, incorporators; Capital, $500,000. For the transportation of freight and passengers, both inland and foreign, upon, over and along the various lines of communications between Chicago and other places in the northwestern, western and southern portions of the United States and foreign countries, via Port Royal harbor, and other South Atlantic and Gulf ports of the United States.

PENNSYLVANIA.

The Spring Garden and Pittsburgh Passenger Railway Company, Allegheny; R. B. Francis, William Roseburg, William McCreery, and others, incorporators; capital, $30,000. For the construction of street passenger railway in the city of Allegheny.

Spring Meeting of the Mechanical Engineers.

The following circular, which carries its own explanation, has just been issued:

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

President's office, Hoboken, N. J., April 12th, 1881.

A regular session of this Society will be held at Hartford, Conn., commencing at 8 P. M., Wednesday, May 4th, next.

Members are reminded that, while extended papers on subjects of general interest, and containing new and important information, are desired by the Committee on Publication, and are welcomed by every member, short memoranda giving, in brief, new information, derived either by direct experiment or from peculiar experiences, are also desired.

A single page often contains the outcome of long and valuable experience, and leads to a debate which brings out facts of inestimable value. Such notes are certain to be well received, and may be presented without hesitation by those who are unable to offer longer communications.

Papers should be forwarded to the Secretary at the earliest possible moment, in order that the Committee on Publication may consider and make recommendation concerning them to the Council before the first day of the meeting. A number of interesting papers have already been sent to the Secretary, and the titles of as many more reported. A Council meeting will be held at the Headquarters of the Society—to be hereafter designated—at half past twelve o'clock of the afternoon of May 4th, next.

The Secretary will shortly publish a programme for the meeting.

Very respectfully,

ROBERT H. THURSTON, *President.*

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☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, APRIL 30, 1881.

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The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

Why Apprentices are Scarce.

The apprenticeship question, although for some time past forming a topic of frequent discussion in daily and weekly papers and magazines of various classes, gains rather than loses in popular interest. How to increase the number of good machinists is about the most important phase of the question. Some of our correspondents have, within the past few weeks, given valuable hints upon the subject. While nearly every shop owner recognizes the need of more apprentices in training to become skilled machinists, not all of them are willing to take boys into their establishments and devote a reasonable amount of time and effort to teaching them the trade.

Quite a number of machine shop owners positively refuse to take any apprentices at all, yet are constantly complaining of the scarcity of skilled workmen. Others again take all the active intelligent boys they can conveniently instruct, and are obliged to decline two or three times as many offers as they can accept. There are bright boys enough who would be willing to go through the full term of a three or four years' apprenticeship if efficient encouragement and assistance were afforded them. In our first issue of the year (Jan. 1,) we suggested a plan to assist apprentices by State appropriations. Shops could be designated in which a portion of the cost of instructing a certain specified number of apprentices who are unable to pay their own way, could be defrayed from the public funds. Free instruction is afforded to children in the public schools of most States, and why should not *some* public provision be made for promoting shop instruction? When private means fail to meet the great and growing industrial demand for more skilled workmen; when important industrial enterprises languish and fail because they cannot obtain enough such workmen, the proper time for government action seems to have arrived.

One reason for the scarcity of apprentices, put forward by many writers, is that the trades unions will permit but a limited number in any shop. However this may be in some trades (and we are convinced that fully half the writers who urge this plea have no positive knowledge of the subject) no such reason exists for a lack of apprentices to the machinist trade. The real difficulty is that, on one hand, very many ambitious youths have no means to help themselves while learning the trade, and find so many shop owners unwilling to give the instruction desired even when they see their way open to undertake the course; and on the other hand, when the advantages of a machinist apprenticeship are offered very many shrink from it as "such a greasy, dirty trade." It often requires a strong exercise of the will to enter upon an apprenticeship course and pursue it to the end, but the reward is likely to follow. An instance, in point, is mentioned in a letter just received by us from one of the proprietors of a large New England cotton mill, from which we take the liberty to quote as follows:

I know something of shop work, having worked for ten years in a machine shop. I was in Europe traveling for two years, and when I returned and made known my intention of entering a machine shop, everybody was surprised. "He'll soon get sick of that," was a common exclamation; but he did not get sick of it. A friend said, "What do you want to go in there for, and get your hands all dirty? All you want is the theory, and you can get that easy enough by looking on." Practical knowledge is of more value than all the theories, and I have never ceased to be thankful that I have a trade, and know something about machinist work after ten years in the shop. But there is very much to learn.

We frequently receive complaints from persons in various parts of the country, that they have failed to find the American Machinist at news stands at which they have inquired for it. In some cases, such persons have been told by newsdealers that their supply of current numbers was all sold out, and no more could be procured, or that certain back numbers were out of print, and could not be furnished. The public are informed that the American Machinist is, or ought to be, readily furnished in any desired quantity by any newsdealer in the United States or Canada, adequate arrangements to this end having been made by us with the American News Company. Not only can a full supply of the current numbers be obtained of any enterprising newsdealer (if your newsdealer is not enterprising, try his competitor across the way); but *all the back numbers* since the commencement (except a few numbers of volume 1, and numbers 2 and 4 of volume 2) can be promptly obtained through the nearest wholesale news company, by any newsdealer who wishes to do business.

The industrial and social life of Mr. Marling, the moulder, is portrayed by Chordal this week with a vividness akin to that which crops out everywhere in the works of Charles Dickens. Mr. Marling does not read the American Machinist (or anything else treating of practical mechanics), but some of the moulders working in the same shop may possibly read to him this animated sketch. If so, we hope he may be spurred to improvement.

Recent developments of activity on the part of the organization which is seeking to introduce the Metric System into the machine shops of this country would seem to indicate, that a meeting of the American Society of Mechanical Engineers would be a good place in which to present that side of the question, the other side having already been presented by Mr. Coleman Sellers. One of the executive officers of the Metrological Society is a member of the Mechanical Engineers' organization, and, however the recent ballot which grew out of the paper of Mr. Sellers last November, may turn out, would doubtless be qualified to handle the subject with grace and force.

Free Passes to Newspapers.

The Central Association of General Passenger and Ticket Agents, at their meeting in St. Louis, Feb. 1st, passed the following resolutions:

Resolved, 1st. That the secretary of the association shall keep a black list, on which shall be entered the names of newspapers, editors, publishers, or other persons who shall be reported by any member of this association, who shall obtain by false representation any free transportation, or having legitimately obtained any such transportation, shall use it for any other purpose than is expressed or implied in the terms specified in the pass or permit, by selling, lending, or in any way disposing thereof.

2. That the secretary shall make monthly reports to the members of the association, of all parties so reported to him.

3. That no party so entered on the black list shall be entitled to or be furnished with any free transportation by any road represented in this association.

4. That whenever all parties on whose account any one has been placed on the black list, shall notify the secretary that the charge is withdrawn, the secretary shall give notice to the association that such party is restored to good standing as to the matter involved.

The causes which led to the adoption of the above resolutions are the natural outgrowth of a pernicious system. Why should editors, publishers, or any others connected with newspapers, by virtue of such connection, be entitled to receive passes to ride over railroads without paying their fare? Favors of this kind have a positive and specific money value, and railroad companies are not apt to grant them to representatives of the press without the expectation of receiving an equivalent in some form. It is not difficult to see what form is understood. Railroads enjoy special privileges from State governments, and not a few of them are putting forth extra efforts to secure more privileges, while anti-monopoly leagues and other organizations are springing up to influence legislatures to restrict those privileges. The assistance of the press in such movements is certainly valuable. The resolutions above quoted are good enough so far as they apply, but something more would be desirable. One black list has just been published, and the effect seems to be salutary. Now let the railroad officials go one step further, and publish a *blue list* embracing the names of *all* newspapers applying for and receiving free passes, and they will soon find their dead-head business materially reduced. Hardly any solid objection can be urged against this plan, while its benefits to the public, to the railroads, and, in fact, to the press itself, in rendering it more independent, are obvious.

The American Machinist has always taken the ground that no *independent* newspaper can afford to accept free passes from railroads or other transportation lines. It has never asked for nor accepted any such favors, although they have at different times been voluntarily tendered, and it has the satisfaction of knowing that the best class of daily and industrial newspapers throughout this country take the same position.

Steam Jurymen.

Many incidents have occurred during recent years, which tend to show that the modern system of trial by jury can be materially improved by bringing it into line with modern mechanical practice.

In the old-time feudal days, the judicial system in vogue, called trial by wager of battle, possessed some positive advantages over our present system of trial by jury. Under that method somebody was pretty sure to be punished for every infraction of the law, while there was a decided economy in time and money for all parties concerned. The later system of weighting culprits heavily, and throwing them into a pond of water, the question of guilt or innocence being determined by the event of sinking or floating, was one that, on some accounts, might perhaps be resorted to in our time. Probably a more certain method, if the culprit happens to be a political marine-boiler inspector, would be to fasten him securely to the life boat of such a steamer as the *Seawanhaka*, paint him till he is securely hard and dry, and let him take his chances for a specified reasonable length of time.

But all such methods of determining the guilt or innocence of a suspected criminal, or the true merits of a case in litigation, have a tinge of barbarism about them, which was, perhaps, well enough in old times, but which is, to say the least, indecorous in these advanced days.

The idea of selecting a jury of reputable merchants to try, or better still, to arbitrate a mercantile cause, is one that would never do at all, as everybody knows that such men would be too likely to know something about mercantile usage, and the principles of equity, to make good jurors from a modern point of view. The plan of selecting intelligent mechanics to act as jurors in cases involving the consideration of mechanical points, is also too obviously simple and sensible to be thought of under our modern system of jury selection. For mechanical cases, merchants, barbers, shoemakers and insurance agents, selected at random, are well known to be more available.

In cases involving great local notoriety the operation of getting a jury together, who not only do not know anything about the case in hand, but are too unintelligent to know anything about anything else, is also one whose phenomena are well known, constituting one of the prime arguments, upon which we mean to rely in advocating the adoption of our proposed system of steam jurymen.

The precise form of the automatic jury-machine to which we refer, need not be outlined here, as it is well known that the American inventive mind is prolific in formulating mechanical appliances to fit every known and a good many unknown and unknowable wants. Of all the different motive powers now in use, steam would probably be the best for this purpose. Certainly, wind, gas and compressed air would be too suggestive of the atmosphere of courts to be available.

It is, perhaps, enough to say that the automatic jurymen, of which the machine would be principally composed, should have such a complete and reliable system of valves and stops as would enable the judge and opposing lawyers to act upon each in turn, to quit when they are through, and insure some kind of a verdict at the close of each trial. Such a machine, if constructed upon correct mechanical principles, would obviously be proof against such absurdities as emotional insanity pleas, and calling in witnesses to swear that they didn't see the crime committed. Above all, it would be proof against the failures to agree after an exhaustive trial, which so frequently tend to make law a swindle, and justice a mockery.

The Spring meeting of the American Society of Mechanical Engineers occurs at Hartford, Conn., Wednesday, May 4th, and the annual meeting of the Railway Master Mechanics' Association June 15th, at Providence, R. I.

Literary Notes.

A NEW TREATISE ON STEAM ENGINEERING: PHYSICAL PROPERTIES OF PERMANENT GASES, AND OF DIFFERENT KINDS OF VAPOR. By John W. Nystrom, C. E. 8vo. cloth; price, $1.50. Also, A NEW TREATISE ON THE ELEMENTS OF MECHANICS: ESTABLISHING STRICT PRECISION IN THE MEANING OF DYNAMICAL TERMS; accompanied by an APPENDIX ON DUODENAL ARITHMETIC AND METROLOGY. By John W. Nystrom, C. E. 8vo. cloth; price, $2. Sold by E. & F. N. Spon, 446 Broome St., New York.

A copy of each of the above valuable books has been placed upon our table by the above-mentioned firm. These books have already had an extensive circulation, and there is scarcely an engineer in this country who has not heard of "Nystrom's Mechanics."

In order that these publications may have a still greater introduction, and to place them within reach of mechanics, and other persons who cannot afford to pay an extravagant figure for books, the prices have been *reduced one-half.*

The treatise on the steam engine is a book designed to supply information in connection with steam engineering, which has heretofore remained untouched in engineering publications.

The author candidly admits that experiment alone can very rarely be expected to give perfect results; but giving an approximation only to the true law of variation it must finally be adjusted and fully established by the aid of mathematics.

To accomplish this desirable result seems to have been the chief aim of the author in writing this book. The work contains some very excellent steam tables, which have been very carefully computed, thus enabling the practical engineer to determine the volume of steam at all pressures up to 1,000 pounds to the square inch. The proper relations between temperature and pressure have been properly adjusted to conform to a uniform curve or law. The old steam tables are, however, used in the body of the work, simply because people have more confidence in them than in the new ones, but the difference between the two amounts to very little practically. The principal formulas are accompanied with examples, and also tables ranging within practical limits, to show at a glance the proper relation between, and proportion of, the operating elements.

The Treatise on Mechanics is a book well appreciated by practical engineers, and was reviewed at length in the American Machinist of Nov. 8, 1879. It is a work which should be carefully studied by every thoughtful student, engineer and mechanic.

Many of the problems are new, and are demonstrated in a plain, practical way. Profound and high-sounding terms have been carefully avoided in both of the books referred to, and a list of rejected terms is appended, giving the reasons for their rejection. The rejected terms are those which have heretofore tended rather to obscure than to reveal the subjects to which they apply, hence only plain practical shop terms have been used by the author of these publications.

Questions & Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1.) E. K. K., Lansdale, Pa., writes: In setting two return tubular boilers, I have blocked the boilers ¼ inch higher than their correct position, and set the front and binder bars in place, and intend building the wall around it. Would it be best to build the wall first, and roll the boilers in endways afterwards? *A.*—It is better to set boilers in their right place first, and then build up the furnace walls; otherwise, in placing the boilers, they would be likely to displace or knock down the walls in being moved to their proper position, or to have a misfit of the boiler and walls. The end to which the blow-off is attached should be slightly lower than the other so that the boiler may be drained by opening the blow-off cock.

(2.) J. A. F., Rockford, Ill., writes: We have some steam pipes, about 80 feet long, conducting steam from the boiler to three vacuum pumps. The pipes were formerly packed in sawdust, which took fire. They are now wrapped in paper, which is in the open air. It has, several times, been set on fire from the steam pipes. Can you explain the reason? *A.*—Many similar cases of steam pipes setting fire to fibrous matter, in contact, or near to the pipes, have been well authenticated. As yet, the explanation of the cause of the material igniting by the steam heat,—so much below the degree of heat assigned for their ignition and combustion—does not remove the mystery of the facts. It is thought the fire takes place, from gradual production of gases, by protracted high temperature of the fibrous materials, making them spontaneously combustible. Pipes should always be covered with some non-combustible material which is also a good non-conductor of heat, of which there are quite a variety. Steam pipes should never be allowed to come in contact with wood work.

(3.) M. R. S., Sacramento, Cal., writes: 1.—I wish to set a brass furnace alongside of my steam boiler; can I turn the furnace flue into the smoke stack, the fireplace, the ashpit or combustion chamber? The boiler is 40″ x 12 ft., and the smoke stack 30″ x 40 ft. Which place for outlet of the flue is best, if either will do? *A.*—If you have an excellent draught, we would advise you to set your brass furnace by the side of the boiler if it will be more convenient; but it is better in all cases, where possible, to communicate directly with the chimney by an independent flue, regulated by a damper. 2.—How can I produce in my brass castings, the bright color of brass goods sold in market? *A.*—After cleaning, the castings should be dipped in a pickling solution, composed of sulphuric acid, 1 part; water, 20 parts, after which they should be washed in clean water, and dried in saw-dust. To give the castings a bright appearance, dip them for an instant in pure, commercial nitrous acid, then wash in clean water, and dry in saw-dust, after which they may be lacquered, if necessary. 3.—We have, in our city, 40 acres of land, covered 2 ft. deep with water, to be pumped up 5 ft. high over a levee, and are at loss to know which is the best pump to use to do the work rapidly. *A.*—The work is not as great as would seem at first. The 40 acres of water, 2 ft. deep, contains 26,052,365 gallons or 217,250,672 pounds of water, and to lift this weight 5 feet high, is 1,086,253,360 foot pounds of work, which is but about 55 horse power employed 10 hours, reckoning 33,000 foot pounds per minute per horse power Any leading pump manufacturer can furnish a pump to do this work quickly.

(4.) M. M., Baltimore, Md., writes: We are replacing a slide valve, on a stationary, condensing engine, 26″ x 30″, by a balanced slide valve. The old valve has 1⅛ outside lap, being 2¼″ longer than the distance between outside edges of the steam ports. To our surprise, we find that the valve has the same lap on the inside as on the outside of the steam ports. We know, by experience, that a high pressure engine will not work to advantage or economy, if it has too much lap on the inner or exhaust side of the steam ports. Should not a slide valve be the same for a condensing engine as for a high pressure engine? *A.*—Without knowing the length and travel of your old valve, and the width of steam ports, bars and exhaust port, it would be impossible to say to what extent the extraordinary inside lap would affect its action in release or exhaustion of steam; but, such a disproportionate inside and outside lap, when the outside lap is so great as 1⅛ inches, is obviously wrong, and must have made the steam exhaust very badly choked and inefficient. It is, however, true that a condensing engine, whose exhaust is aided by the steam escaping into a vacuum, will admit of greater inside lap of the slide valve than a non-condensing, high-speed engine; because, the latter is run at higher speed, and its exhaust has more resistance, so that the steam cannot as quickly escape. For this reason locomotive engines now have little or no inside lap of their valves, and, in many cases, have an inside clearance of 1-32 inch.

(5.) W. A., Buffalo, N. Y., writes: I have some shafting, in which I bore a 13-16″ hole, 24″ deep, using a twist drill, but sometimes it gets cutting, and then it gives a good deal of trouble. Perhaps you can inform me of a better way of boring the holes. I do not care if the hole should run out of true 1-32″. *A.*—Use a half round drill, which will be found to work much better than a twist drill. It should be frequently cleaned and kept well oiled.

(6.) E., Newark, N. J., asks: What will be the power required to drive each and all of the following machines (see answer)? *A.*—This question we referred to Samuel Webber, of Manchester, N. H., who has for years devoted his time to testing machinery of all kinds, and whose statement can be relied upon. Mr. Webber has kindly answered the questions in detail as follows, from his Records of Tests of Tools, viz.:

	H. P. each.	H. P.
Nine 18″ Engine Lathes at	0.100	0.900
Two 30″ " " "	0.200	0.400
Three 16″ Hand " "	0.100	0.300
Three 36″ Drills " "	0.250	0.750
Three 16″ " " "	0.200	0.600
Three 6 ft. Planers " "	0.250	0.750
One 12 ft. " " "	0.500	0.500
Three 12″. Shapers " "	0.250	0.750
Total		4.950
Countershaft for each tool, if in good order, 1-10 H. P. or		2.700
Total		7.650
If the tools only run ¾ time, deduct ¼ of 4.95 or		1.238
Leaves,		6.412

Or 6½ horse power. The result depends somewhat on the work done, but I should suppose from the list of tools given, that the work is light, such as sewing machines, or repairs on same, or work of a similar character, and the tools kept in good order.

Business Specials.

50 cts. a line for each insertion under this head.

Special Notice.—Owners and managers of large establishments throughout the country will find information of positive value in our 75 page illustrated pamphlet, entitled "Useful Information for Steam Users." It contains data on the care and management of Steam Engines and Boilers and Rules for Engineers and Firemen. Sent for 25c. in P. O. Stamps. The J. N. Mills Publishing Co., 165 Broadway, New York City.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N.J.

"Patent Binder" for the American Machinist holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. American Machinist Publishing Co., 96 Fulton St., New York.

Tube Cleaners from 2″ to 4″ $1.00 each. American Tool Co., Cleveland, O.

"Extracts from Chordal's Letters" in book form, now ready. Cloth. 320 pages. $1.50 by mail, postpaid. American Machinist Publishing Co., 96 Fulton Street, New York.

1-16 to ⅛ Steel Figures $1.00 per set, Letters $3.00 per set. American Tool Co., Cleveland, O.

James W. See, Designing and Consulting Engineer, Hamilton, Ohio.

J. C. Hoadley, Engineer and Expert, formerly of Lawrence, Mass., has opened an office at 29 High St., cor. Federal, Boston, Mass., where he will be pleased to receive old and new friends.

Steam Engines Indicated and Examined. Power Measured. W. H. Odell, P. O. Box 274, Yonkers, N.Y.

Bound volumes for 1880 of the American Machinist.—We can furnish Vol. 3 of the American Machinist, containing the full 52 issues of 1880, neatly bound in cloth, ready to ship by express, for four dollars. American Machinist Publishing Co. 96 Fulton Street, New York.

Wood Engravings of Machinery and Tools. Satisfaction guaranteed. Chas. Murray, 58 Ann St., N.Y.

Wanted to arrange with responsible parties for the manufacture of a New Air Compressor. The best yet designed. John Fish, 8 Pine Street, New York.

Manufactures.

Racine, Wis., expects to have a watch factory.

Youngstown, Ohio, is soon to have a brass foundry

New car shops at Lima, Ohio, are nearly completed.

John Helt will start a new carriage factory at Ravenna, Ohio.

Morehouse Bros. are erecting a new paper mill at Bridesberg, Pa.

The Cohoes (N. Y.) Rolling Mill is putting in five new furnaces.

Waukegan, Ill., expects to have a new scale factory the coming summer.

The Revolving Scraper Company, Columbus, O., proposes to enlarge its shops.

Briggs & Kelley, Ayer, Mass., will put a large cupola in their iron foundry.

St. Louis (Mo.) Stamping Company has increased its capital stock to $1,000,000.

The Hussey Plow Company, North Berwick, Me., are about to erect a new iron foundry.

Pitkin Bros., boiler manufacturers, Hartford, Conn., are about to enlarge their shops.

Dalton, Ga., and Cartersville, Ga., are each moving towards establishing new cotton mills.

Pennock Bros., Minerva, Ohio, are enlarging their car shops by erecting a building 60 x 100 feet.

The Brush Electric Light Company, Cleveland, O., is putting up a large addition to their new works.

Trevor & Company, Lockport, N. Y., are adding to their machine shop a structure 30x42 ft., three stories high.

The Clark Thread Company, Newark, N. J., will proceed at once to erect a spinning factory of 60,000 spindles.

Forsyth Scale Company, Youngstown, O., are building an addition to shop and foundry, doubling their capacity.

Col. T.W. Peirce, San Antonio, Texas, has offered a bonus of $1,000 towards erecting a paper mill in that city.

The Pullman Palace Car Company has voted to increase its capital stock 33⅓ per cent., making it $8,000,000.

Union Iron Works, Decatur, Ill., manufacturers of special machinery, will soon erect a three-story brick extension to their shops, 100x50 feet.

The Brooks Locomotive Works, Dunkirk, N. Y., are enlarging their shops, and will, it is said, employ 300 more men making 1,000 in all.

O'Connor & Co. are to establish a mining and manufacturing business at Gadsden, Ala., which will give regular employment to 150 hands.

Edwin H. Wood has just started to build a shop 122x40 feet, at the junction in Worcester, Mass., for the manufacture of woolen machinery.

Porter & Meakin, of the Atlanta Machine Works in Atlanta, Ga., have recently extended their foundry and built a new erecting shop for cars.

The work of rebuilding the shops of the Jacksonville, Pensacola & Mobile Railway Company, at Talahassee, Fla., recently destroyed by fire, has been commenced.

The Lobdell Car Wheel Company, at Wilmington, Del., has recently bought a tract of 200 acres of land on the south side of the Christiana, for the purpose of extending its works.

The repair shops of the Union Pacific Railroad are to be immediately enlarged to a considerable extent, so as to increase the capacity of building their own cars.

Walter S. Grosh, of Reading, Pa., is about to build a shop at Walnutport, for the manufacture of steam engines and machinery. The building is contracted for.

The Paige Wrought Metal Car Wheel Company will soon begin the manufacture of patent car wheels in Springfield, Mass. W. H. Paige is at the head of the concern.

The large iron works known as the Jesse W. Starr Iron Works, at Camden, N. J., have been closed, throwing a large number of hands out of employment.

William Perry will erect an iron foundry at Brockton, Mass., with a capacity of about 10 tons a day. He has just completed a large building to let for manufacturing purposes.

Scheidler & McNamer, Newark, O., builders of steam engines, etc., have dissolved. J. H. McNamer continues, and Mr. Scheidler will erect large new shops in the same town.

The Grant Machine Tool Works is one of the prospective new establishments of Hartford, Conn. A stock company is now organizing, and it is expected to erect a new shop, and be ready to build first-class machine tools some time next summer.

The Knowles Steam Pump Works, of Warren, will ship to Omaha, Neb., two of the largest pumps ever made at the shop. They are for the city water works. One is a direct-acting compound condensing engine, with a capacity of three million gallons every twenty hours.

Harris, Son & Co., manufacturers of "The New Brantford" mower and reaper, and other harvesting machinery, Bradford, Ont., employ 150 men in their shops, and are pushed with orders. They publish the *New Brantford Monthly*, which will be sent free to any one sending his address.

The Stiles & Parker Press Co., Middletown, Conn., write us: Business has been driving the past year, but of late it is pushing us to the wall. We almost dread to open our letters, fearing some of our customers will want something we cannot supply them in the time specified.

The Crosby Steam Gage and Valve Company, of Boston, are so crowded with orders for steam-users' specialties that they are obliged to increase their manufacturing capacity. To this end they have decided to erect a new factory in that city, 105 feet long and three stories high. The plans have been drawn up and it is expected to have the new shop in operation some time in July or August next.

It is reported that the men who have been discharged from the mills at Fall River, for testifying against the manufacturers before a legislative committee have also been "blacklisted," so that they cannot obtain employment at Fall River, and perhaps other cities. Few even of the manufacturers justify the discharge, and it is reported that a legislative investigation may be made.—*Springfield Republican.*

The Babcock & Wilcox Co., whose incorporation we noticed last week, was organized to purchase and carry on the boiler-manufacturing business of Babcock & Wilcox, 30 Courtlandt St., New York. All business up to April 1 will be settled by the firm and all thereafter by the new company. The boiler will continue to be built, for a time, at the Singer Mfg. Co., Elizabethport, N. J. Several of the latter company are among the incorporators of the Babcock & Wilcox Co. They have orders for 13,000 H. P. of boilers now upon their books. They have projected a new shop to manufacture the boiler in Glasgow, Scotland.

The Cleveland Co-operative Stove Company, says the St. Louis *Age of Steel*, are about to enlarge their works in this city by the addition of a brick building, four stories high, covering an area of 60 x 140 feet. The ground floor of this building is to be appropriated to the moulders, while the upper floors are to be used for assembling, fitting and finishing of stoves. The new building is to be supplied with every convenience in the way of machinery, tools, etc., as is found in all first-class establishments. This addition will increase the capacity of the works about 100 per cent.

Machinists' and Engineers' Supplies.

New York, April 14, 1881.

The supply market during the past week has been a little slack but has increased in activity during the past two days. Prices remain unchanged and there is little produced in the shape of new tools, the manufacturers being busily engaged upon the regular line of goods.

At a recent meeting of bolt and nut manufacturers it was resolved to adopt the following discounts, viz: Machine bolts and lag screws 65 and 5 per cent., Nuts, 8½c. and Washers, 7¼c. off lists.

Iron and Metal Review.

New York, April 14.

Pig iron is dull and quiet. The market is not as strong as it has been, and lower figures are anticipated. Quotations remain at $25 to $26 for No. 1, $22 to $23 for No. 2, $21 for gray forge. Scotch pig is weak and without much business to speak of; quotations are: Coltness, $23.50, Glengarnock $22.50 Eglinton $21.50, Carnbroe $22 and Gartscherrie $22.50 to $23. Rails are in good demand at $62 to $65 for steel, and $48 to $50 for iron at the mills. Old T rails sell at $26.50 to $27. Wrought scrap is very quiet at $30 to $31 from yard for No. 1. Quotations of boiler plate remain as follows: Tank Iron, 2¾c.; Refined Boiler Plate, 3¼c.; Shell, 3¾c.; Flange, 4¾c.; Extra Flange, 5¼c.

Ingot Copper sells at 19¼c. for Lake. Straits, Australian and Billiton Tin remains firm at 20¼c. Common Pig Lead, 4⅞c; Refined Lead, 5c. to 5¼c.; Domestic Spelter, 5c. to 5¼c. Sheet Zinc, 7c. Antimony, 14½c. for Hallett's, and 15c. to 15¼c. for Cookson's.

WANTED

Wanted.—Foreman for machine shop doing a general business. He must be an energetic and thorough mechanic. Eagle Iron Works, Des Moines, Iowa.

Wanted.—A first-class man skilled in running a Brown & Sharpe Universal Grinding Machine. The Hartford Engineering Company Hartford, Conn.

Wanted.—A young man, thorough draughtsman and constructor, who has had eight years' practical experience as inventor and machine designer, desires engagement. No objection to any part of the country. Address, Andrews, care Am. Machinist.

A young man, a graduate of a scientific school at an eastern college, with several years experience in the machine shop and designing machinery, desires an engagement. Address M. Engineer, American Machinist, 96 Fulton St., N. Y.

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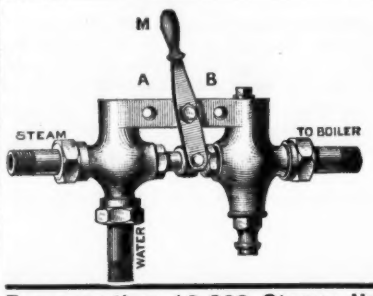

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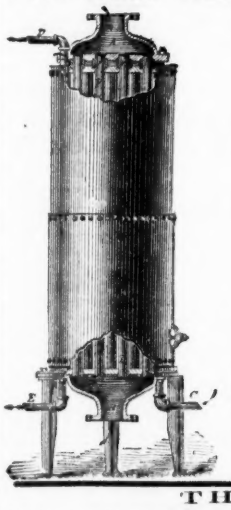
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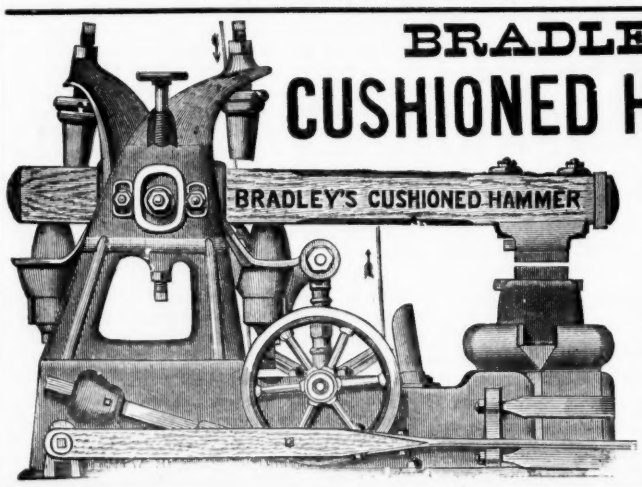

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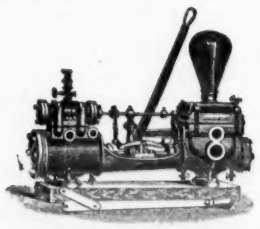
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Jas. D. Foot, Esq., Waterbury, Conn., Nov. 8th, 1878.
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FARREL FOUNDRY & MACHINE CO., E. C. Lewis, Ag't.
We print on card board 10 x 12 in. "Instructions on the use of Files," which are intended for shop use. These instructions with our "Illustrated Catalogue of Files" we mail on receipt of 25 cents postage. To customers we mail a complete set free of charge.
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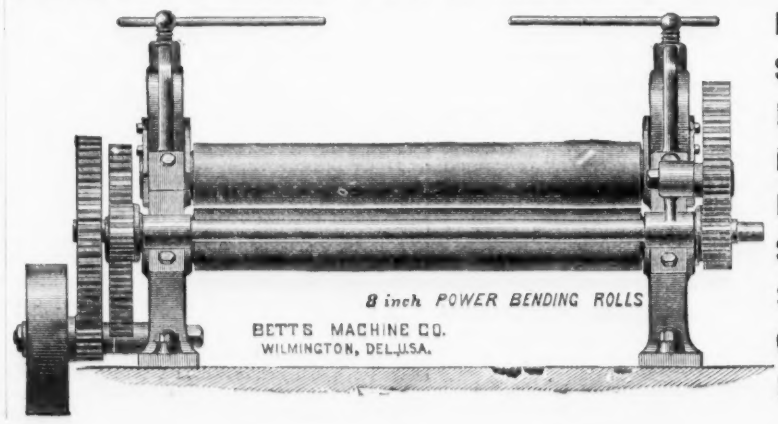

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